

DAIRY WASTE  
WATER QUALITY MANAGEMENT PLAN

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## INTRODUCTION

This document is the Dairy Waste Water Quality Management Plan for the State of Washington, prepared by the Conservation Commission pursuant to Section 208 of Public Law 92-500 (now Public Law 95-217, commonly referred to as the Clean Water Act). The purpose of this plan is to describe a process by which dairy farmers, whose operations are causing an animal waste water pollution problem, may be given the time and technical assistance necessary to correct the problem.

### ACKNOWLEDGMENTS

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## SUMMARY

### Background

An extensive federal and state effort to cleanup the nation's waters was initiated with the passage of the 1972 Federal Water Pollution Control Act Amendments (PL 92-500). The act set a broad water quality goal of fishable-swimmable waters, wherever attainable, by 1983. EPA was given the authority to implement the Act, but primary responsibility for water pollution control was reserved for the individual states.

The 1972 law defines two sources of pollution -- point and nonpoint. Point sources are "end-of-pipe" discharges, such as those from industries and sewage treatment plants, and from concentrated animal feeding operations. All point sources discharging to navigable waters <sup>1/</sup> are controlled by the National Pollutant Discharge Elimination System (NPDES). With respect to dairy operations, which may be subject to NPDES permit requirements, individual permits would be written for each discharger specifying the effluent limitations, schedule of compliance, and special conditions if applicable. Nonpoint sources of pollution, having no easily identifiable discharge point, include such sources as urban, construction, agricultural and silvicultural runoff, and seepage from septic tanks and landfills.

### The 208 Program

Section 208 of the 1972 Amendments requires each state to develop an Areawide Water Quality Management Program. Pollution control requirements for both point and nonpoint sources are to be tied together under this program, which is to be implemented by November, 1978.

Prior to the 1978 deadline, a two-year planning process was set in motion to identify sources of pollution within each planning area, determine priorities, and develop methods of local implementation and control. Public participation is an essential element in the planning process.

### Statewide 208 Planning

The Department of Ecology (DOE) is the agency responsible for 208 planning in the State of Washington. In accordance with EPA regulations, the agency had the following three options:

1. Designating regional planning agencies to conduct their own 208 planning.
2. Delegating the responsibility of examining specific pollution problems to other government agencies.
3. Undertaking 208 planning for the entire state.

<sup>1/</sup> The term "navigable waters," as defined in EPA regulations (40 CFR 125.1 (p)), includes virtually all surface waters of the state.

The Washington statewide 208 program is a combination of all three options.

Three regional planning agencies, METRO (Seattle), SNOMET (Snohomish and King counties), and the Regional Planning Council of Clark County were designated to do 208 planning within their respective jurisdictions. Both SNOMET and Clark County developed dairy waste management plans.

The Washington State Conservation Commission was delegated responsibility for conducting the 208 planning process for dairy waste management outside the designated areas and for nonpoint source pollution abatement in dryland agriculture.

DOE assumed 208 planning responsibilities for all other pollution sources outside the designated areas. Included in this group were irrigation return flows and forest practices.

#### Statewide 208 Dairy Waste Water Quality Management Plan

This plan was developed by Conservation Commission and Department of Ecology staff with the advice and counsel of an Ad Hoc Dairy Waste Advisory Committee. The plan is designed to provide every possible opportunity for dairy operators who have a waste discharge problem to voluntarily correct the problem and, thereby, avoid the risk of penalties and the necessity of obtaining an NPDES waste discharge permit. It provides for technical assistance in the development of a waste management program to fit a particular farm situation. The plan also provides for an enforcement procedure to be invoked only as a last resort after an operator has failed to exercise any of the voluntary options.

A key element of the plan is a list of Best Management Practices (BMP) by which dairy waste problems can be solved. A BMP is defined as "an agronomic, managerial, or structural practice that, when used singly or in combination with other BMP as components of an approved farm waste management plan, addresses the minimum essential treatment needed to solve site specific water quality problems."

The implementation procedure describes a process whereby water pollution problems caused by dairy waste are identified both by a systematic screening process and by a complaint system. Once a problem is identified, a procedure is activated which leads to the development, approval, and implementation of a farm waste management plan which includes BMP as needed to solve the specific waste management problem. Technical assistance in waste management plan development and implementation is available through the conservation district (CD) to those who request or are willing to accept such assistance. For certain eligible BMP, financial assistance is available on a cost-sharing basis through the ASCS Agricultural Conservation Program (ACP).

Upon notification of a dairyman that his operation is causing a water pollution problem, a period of six months is allowed for the development of a farm plan. Following plan approval by the CD, a negotiated period of up to 18 months is allowed for implementation. Provisions are made

for an extension of the deadline in the event the schedule is disrupted due to circumstances beyond the dairyman's control, or to correct an error in estimating the time required for completion.

If, at the end of the negotiated period or its extension, little or no progress has been made, the Department of Ecology could require an NPDES or state permit. Depending on the circumstances, the dairyman could also be subject to penalties as prescribed by federal and/or state water pollution control laws.

The plan provides for a continuous information/education program through the joint efforts of the Cooperative Extension Service and conservation districts. Its purpose is to promote the highest possible level of voluntary cooperation by dairymen who have a waste management problem. The success of the program is measured not only by the degree of cooperation on the part of those dairymen who are brought into the program via the screening or complaint process, but also by the extent to which dairymen recognize problems and take corrective action in time to avoid being identified as a problem source.

Agencies responsible for program implementation are the Department of Ecology, local conservation districts, and the Conservation Commission. Agencies responsible for supporting services are the Cooperative Extension Service, Soil Conservation Service, and county ASC committees. Either public or private farm credit institutions may also assume a supporting role whenever credit is needed to facilitate the installation of BMP.

Procedures for revising elements of this plan involving minor changes may be handled by the agencies renegotiating their memoranda of agreement. Major changes affecting goals and objectives of the plan, regulatory actions, implementation schedules, and milestones can only be changed after a public review process. Requests for major changes may be made by any of the parties responsible for plan implementation. Requested changes will be submitted to the DOE for action. DOE will then evaluate the requested action in terms of its anticipated impacts on meeting future water quality goals. Requests found consistent with meeting the goals and objectives of 208 planning will be taken through a public review process. Comments will be sought at the local level through conservation districts and dairymen as well as through public hearings. Final action to amend the 208 plan will be taken following consideration of all public comment on the proposed changes.

DOE will update the dairy waste 208 plan annually such that it remains a meaningful and current water quality management document. This update will include recommendations made by those responsible for plan implementation and will require a public review process.

#### Assurances For Plan Certification

State certification of the Dairy Waste Water Quality Management Plan is based on assurances that the plan meets all applicable requirements of the 1972 Federal Water Pollution Control Act Amendments (PL 92-500) and of federal regulations 40 CFR 130 and 131.

This certification addresses six specific assurances that the state, through the office of the Governor, must provide to the Regional Administrator of the U.S. Environmental Protection Agency. These assurances, and the Governor's certification that they have been accomplished, will provide a basis for final acceptance of the plan by EPA.

Each required assurance followed by a statement describing how it will be satisfied is presented as follows:

#### Assurance Number I

"Each state . . . water quality management plan, or portion thereof, shall be adopted as the official water quality management plan(s) of the state."  
40 CFR 131.20(h)

The statewide 208 plan will be incorporated into the federal water quality planning requirements (i.e., five-year strategy, annual program plan, continuing planning process, etc.). The state will use the 208 plan in the development and implementation of state water quality policies.

Other environmental programs will be coordinated with the statewide plan. DOE will continue as the state planning agency and, as such, will have responsibility to coordinate state agency participation in the plan. The department will:

1. Inform all DOE sections and state agencies of the plan and its contents;
2. Coordinate other water quality programs associated with plan elements;
3. Coordinate with local agencies for any updates or approval processes; and,
4. Continue its role as coordinator and liaison between local, state, and federal governments.

#### Assurance Number II

"Each adopted water quality management plan shall include assurances . . . by the Governor that the plan is the official water quality management plan for the area covered by such plan . . . ." 40 CFR 131.20(h)

The dairy waste plan was developed for statewide application and is the official dairy waste element of the statewide 208 water quality management plan.

#### Assurance Number III

". . . the plan will be implemented and used for establishing permit conditions, nonpoint source controls, schedules of compliance and priorities for awarding grants for construction of municipal treatment works pursuant to Section 201(g) of the Act . . . ." 40 CFR 131.20(h)

When the plan is certified, it will be used where applicable to establish state permit procedures, construction grant priority ratings, and long-range water quality management goals.

Assurance Number IV

"The plan meets all applicable requirements of the Act, this part, and Part 130 of this Chapter." 40 CFR 131.20(h)

Assurance Number V

"At the time of submission, the Governor, or her designee shall identify those modifications, if any, that need to be made, as a result of the plan, to the agreement between EPA and the State." (State/EPA Agreement) 40 CFR 131.20(k)

At this time, no modification to the State/EPA Agreement is necessary.

Assurance Number VI

"The Governor, or her designee, shall find that the plan provides an adequate basis for selection of management agencies to be designated pursuant to 40 CFR 130.15(a), and Section 208(c) of the Federal Water Pollution Control Act." 40 CFR 131.20(f)(1)(iv) The basis for selection of a management agency is identified in a federal Program Guidance Memorandum, "The Acceptance and Approval of Plans and Designated Agencies," dated September 6, 1977.

The Department of Ecology, because of its responsibility for administering the NPDES permit program in the state, will be designated as the management agency for the dairy waste plan. However, to assure effective implementation and to provide local solutions to local problems, specific management functions will be delegated to the Washington State Conservation Commission and to the respective conservation districts through a series of three-party memoranda of agreement (see Appendix A). In addition, these responsibilities plus a description of major agency actions and financing arrangements, will be contained in a management agency implementation statement (MAIS) to be prepared by DOE.

It has been confirmed, through a review of the appropriate statutes and consultation with legal counsel, that each agency has existing authority to carry out the portions of the plan assigned to it. The DOE, charged with administering the NPDES permit program in the state, has sufficient regulatory authority to carry out its responsibilities, both as the designated management agency and as the enforcement agency.

Prior to executing each memorandum of agreement, the DOE will verify that each party has the legal, financial, managerial, and institutional capability to carry out its assigned responsibilities.

The willingness of each agency to proceed with implementation of its assigned responsibilities will be demonstrated by its signature to the memorandum of agreement.

## EPA REGULATIONS AFFECTING CONCENTRATED ANIMAL FEEDING OPERATIONS

The Environmental Protection Agency on March 18, 1976 published revised regulations for applying the National Pollutant Discharge Elimination System (NPDES) to concentrated animal feeding operations. Principal provisions of the regulations pertaining to dairies follow:

### Definition of Concentrated Animal Feeding Operations

A lot or facility where at least 700 mature dairy cattle are confined and fed or maintained for a period of 45 days or more in any 12 month period, and in which crops, vegetation, forage growth, or post harvest residues are not sustained in the normal growing season; or

A lot or facility as defined above, with between 200 and 700 mature dairy cattle which meets the following criteria:

Pollutants are discharged into navigable waters through a man-made ditch, flushing system, or other similar man-made device; and/or

Pollutants are discharged directly into navigable waters which originate outside of and pass over, across, through, or otherwise come into direct contact with the animals confined in the operation.

No animal feeding operation is a concentrated animal feeding operation as defined above if it discharges only in the event of a 25-year, 24-hour storm event.

### Case-by-case Designation of Concentrated Animal Feeding Operations

The state pollution control director (Director, Department of Ecology) may designate any animal feeding operation not otherwise falling within the above definition as a concentrated animal feeding operation upon consideration of the following factors:

1. Size of the animal feeding operation and the amount of wastes reaching navigable waters.
2. Its location relative to navigable waters.
3. The means of conveyance of animal wastes and process waste waters into navigable waters.
4. Slope, vegetation, rainfall, and other factors relative to the likelihood of frequency of discharge of animal wastes and process waste waters into navigable waters.
5. Other such factors relative to the significance of the pollution problem sought to be regulated.

However, no such designation can be made unless (1) pollutants are discharged into navigable waters through a man-made ditch, flushing

system, or other similar man-made device, or (2) pollutants are discharged directly into navigable waters which originate outside of and pass over, across, through, or otherwise come into direct contact with the animals confined in the operation.

The permit requirements relative to the case-by-case designation of concentrated animal feeding operations differ in two important respects from those which apply to larger operations which are included by definition:

1. An NPDES permit application can be required only after an on-site inspection of the designated operation and a determination made that the operation should and could be regulated under the permit program.
2. No application can be required unless such owner or operator is notified in writing of the requirement to apply for a permit.

#### NPDES Permit Requirements

The regulations require persons who discharge or propose to discharge pollutants from a concentrated animal feeding operation to file an application for an NPDES permit by September 1, 1976.

Certain dairy operations, depending on size, location, and other factors, are one of several types of livestock enterprises which may be affected by the March 18, 1976 EPA regulation and NPDES permit requirements.

Following is a summary of permit requirements affecting dairy operations:

Dairies of More Than 700 Mature Cattle <u>1/</u>	Dairies of More Than 200, but Not More than 700 Mature Dairy Cattle <u>1/</u>	Dairies of Not More Than 200 Mature Dairy Cattle <u>1/</u>
Permit required if there is a discharge <u>2/</u> of pollutants.	Permit required if dairy (1) discharges <u>2/</u> pollutants through a man-made conveyance, or (2) discharges <u>2/</u> pollutants into waters passing through or coming into direct contact with animals in the confinement area.	No permit required (unless case-by-case designation as provided below.)  Case-by-case designation only if feedlot (1) discharges <u>2/</u> pollutants through man-made conveyance, or (2) discharges <u>2/</u> pollutants into waters passing through or coming into direct contact with the animals in the confined area, and after on-site inspection, written notice is transmitted to the owner or operator.

1/ The term "Mature Dairy Cattle" as used in the above table includes both milked and dry animals.

2/ Dairy not subject to requirement to obtain permit if discharge occurs only in the event of a 25-year, 24-hour storm event.

## HOW DAIRY OPERATIONS AFFECT WATER QUALITY

### General Assessment

Not all dairies cause water quality problems. There are many that do not discharge animal wastes into surface waters. Likewise, the water quality problems associated with the dairy industry cannot be said to occur only in certain locations. They are statewide in scope. With few exceptions, any dairyman that fails to employ good management practices can cause a problem. When there are several dairies in the same area contributing to a problem, it becomes magnified.

Surface discharge of animal wastes into the waters of the state affects water quality in the following ways: (1) bacterial contamination, (2) addition of nutrients, such as phosphates and nitrates, which accelerate the growth of aquatic algae and weeds, (3) addition of organic material which depletes oxygen in the water, and (4) suspended solids which impair photosynthesis by aquatic plants.

According to the U.S. Department of Agriculture, there are over 1700 dairies in the State of Washington. Poor manure handling practices at some of these dairies has resulted in water quality degradation to state waters.

### Principal Causes of Surface Water Contamination

Although the relationship between dairy operations and water quality has not been studied on a statewide basis, the recent field sampling program in the three designated 208 areas (SNOMET, METRO and Clark County) revealed several ways in which dairy waste contamination of surface waters occurred. These are as follows:

#### Runoff from Animal Confinement Areas

Many dairy operations keep their cattle confined to small areas. If adequate waste facilities are not present, confinement of large numbers of cattle can lead to serious water pollution problems. Runoff from these areas will be highly contaminated with manure.

#### Field Application of Manure

Field application of manure can result in surface water contamination during certain times of the year and on some soils and slopes. Management practices which fail to consider climatic and soil factors are at the root of the problem. They include the following:

1. Spreading manure on a sloping field which is frozen or covered with snow;
2. Spreading manure in a field containing ponded water if the ponds drain directly into waterways;

3. Sealing the soil by over-application of solid material; and
4. Compaction of soil by heavy equipment (reduces infiltration rates and causes runoff).

#### Seepage from confinement areas located adjacent to streams or drainage ditches

Most western Washington counties have a wet climate with many streams and drainageways. Contamination of these waters due to seepage from confinement areas is a major problem.

#### Insufficient manure storage and handling capacity

Farms with inadequate storage capacity for liquid manure have caused degradation of water quality. Manure holding areas have to be sufficiently large to allow storage of the material until conditions permit field application or until other disposition can be made of it. Holding areas must have sufficient storm protection to prevent overflow or discharge of contaminated water.

#### Animal Access to Streams

Streams flowing through or adjacent to animal confinement areas are subject to pollution from animal wastes and streambank erosion sediment if not afforded adequate protection. Uncontrolled access to streams and ditches by large numbers of grazing animals also contributes to water pollution.

#### Major Pollutants in Dairy Waste

Following are the major pollutants in dairy waste discharges in order of significance:

##### Fecal Coliform

The Department of Ecology's ambient water monitoring efforts have revealed a number of water quality problems in some surface water segments of the state. Foremost among these is high concentrations of coliform which are found in small streams, such as Salmon Creek in Clark County, or large rivers, such as the Snohomish River. Densities recorded along these receiving waters are usually well above existing state standards. While high fecal coliform bacteria readings are significant, because they raise the possibility of the presence of human or animal pathogenic bacteria in the receiving waters, high total coliform may simply be due to the presence of large numbers of relatively harmless soil coliform bacteria. This results from soil erosion that occurs along some waterways. In order to establish a relationship between water quality problems and the dairy industry, more emphasis should be placed on collecting fecal coliform data in streams adjacent to or near dairy farms.

### Organic Material

The second major pollutant originating from dairy operations is organic material. When allowed to enter a stream, this organic material is decomposed by microorganisms in the water. In breaking down the organic matter, the microorganisms consume oxygen in the water. This biological process will degrade water quality by depleting its oxygen content. Oxygen depletion, in turn, can have a catastrophic impact on life in the water body. Fish and other aquatic organisms must have oxygen to survive.

### Suspended Solid Waste

The third major pollutant in dairy operation discharges is suspended solid wastes, such as coagulated milk. These solids discolor and cloud the water and impair photosynthesis by aquatic plants. The suspended solids sink to the bottom and can further deplete the water's oxygen content. As it decomposes, it gives off gases that are toxic to aquatic life and causes odor problems.

In summary, high fecal coliform concentrations, organic materials, and suspended solids will adversely effect beneficial water uses, such as fishing, swimming, and other recreational uses. Depletion of oxygen in the water suffocates fish and may create offensive odors. A high concentration of fecal coliform, indicating the possible presence of pathogenic bacteria and virus, may pose a threat to the health of those people who come in contact with contaminated streams.

## BEST MANAGEMENT PRACTICES

The major feature of this plan is the voluntary procedure through which dairymen can realistically expect to meet the 1983 national water quality goals of Public Law 92-500, and the Water Quality Standards adopted by the State of Washington and, thereby, avoid the additional inconvenience of the NPDES permit procedure.

The voluntary procedure depends on the selection and implementation of management techniques to solve a particular problem on a particular farm. Such techniques are referred to in EPA regulations as Best Management Practices (BMP).

A BMP is an agronomic, management, or structural practice that, when used singly or in combination with other BMP as a component of an approved farm waste management plan, addresses the minimum essential treatment needed to solve site specific water quality problems.

The BMP incorporated in a farm waste management plan would be those which the conservation district, in consultation with the farm operator, determine are effective in the management of dairy wastes. That is to say, they would eliminate the discharge of pollutants into surface waters of the state from dairy animal confinement areas, from manure storage facilities, and from field applications of manure.

A Farm Water Quality Manual published in September 1977 by the Snohomish County Planning Department (SNOMET), one of the designated 208 planning agencies, contains an illustrated description of BMP which were designed to control dairy waste problems in that area. Since the manual identifies practices which are capable of solving dairy waste problems wherever they occur within the state, it was adopted by the Conservation Commission and the Ad Hoc Dairy Waste Management Advisory Committee as an element of this plan. This manual is included as Appendix B to this plan.

## DAIRY WASTE WATER QUALITY MANAGEMENT PLAN

### Geographical Area

This management plan applies statewide, including designated planning areas. It is recognized, however, that both the SNOMET/King County and Clark County 208 designated areas have initiated dairy waste management programs. Consequently, these areas are generally ahead of other counties in identifying and correcting dairy waste problems. The DOE will coordinate its activities with the conservation districts in these designated areas during implementation of this plan.

### Implementation Procedure

#### Dairies of More than 200 Mature Animals

Identification of Dairy Farms: The Department of Ecology has developed, as part of the NPDES process, a list of dairies in the state of over 200 mature animals.

Screening Process: The Department of Ecology (DOE) regional staff will perform screening in order to categorize those dairies of over 200 mature animals to determine: (1) those in excess of 700 which have existing or potential discharges to surface waters, (2) those dairies that are in the 201 to 700 range that meet the criteria of concentrated animal feeding operations, and (3) those dairies that have no discharge. If the dairy operation falls into group 3, no action is required either by the Department of Ecology or the operator.

Notification Letter: The department will issue an information letter to operators of dairies of more than 200 mature animals which have been identified as concentrated animal feeding operations. The letter will notify the dairy operator that he may avoid being regulated under a permit by exercising the voluntary options available to him. He will also be advised that assistance is available through the local conservation district and that someone from that office will be contacting him to offer such assistance. A copy of the letter will be sent to the conservation district with a request to contact the dairy operator.

Complaints by General Public: In case of a complaint concerning an alleged pollution problem regarding a particular dairy farm regardless of its size, the Department of Ecology regional staff or the conservation district will perform on-site inspection in order to determine if the farm does in fact: (1) have a significant water quality problem, and (2) meets other criteria of a concentrated animal feeding operation as well. Where appropriate, the Department of Ecology may require immediate action on the part of the operator to correct the water pollution problem. In such case, the conservation district will be notified as soon as possible. If the situation does not warrant immediate corrective measures, but rather a long-term effort, the Department of Ecology will notify, in writing, both the conservation district and the dairy operator of its determination.

### Procedures for Receiving a Complaint:

1. Name and address of complainer
2. Location of problem area
3. Nature of problem

\* Notification: Upon notification, the operator and conservation districts would have a period up to six months to develop a farm waste management plan that would set out a course of action that would allow the operator to come into compliance and satisfy the requirements of the state and federal water pollution control laws. However, should the operator choose to take corrective action within the six-month period that would satisfy water pollution control requirements, a farm waste management plan would not be required. Completion of such corrective action within the six-month period will be verified by the conservation district with written notification to the operator and the Department of Ecology regional staff.

Farm Waste Management Plan: In a farm waste management plan, the dairy operator would agree to implement such BMP as are necessary to eliminate the water pollution problem. Such a plan, executed between the dairy operator and the conservation district, shall also specify a period of time up to 18 months for completion of the planned corrective measures.

The DOE, as the designated management agency for the statewide dairy waste program, will either review and approve dairy waste management plans or delegate its review and approval authority to conservation districts at their request.

Satisfactory completion of the corrective measures specified in the plan will eliminate the water quality problems.

### Dairies of 200 Mature Animals or Less

C In case of a complaint regarding a particular dairy operation of up to 200 mature animals, the Director of the Department of Ecology shall determine whether such operation should be designated as a concentrated animal feeding operation. If the director determines that such operation meets the criteria of a concentrated animal feeding operation as defined in the March 18, 1976 EPA regulations, the above sequence of events beginning with the section entitled "Notification" will apply.

### NPDES or State Permits Requirements

\* If, during the first six-month period, the operator has failed to enter into a farm plan agreement, the conservation district would notify the Department of Ecology regional office that they have an unwilling

operator in the voluntary program. At that time, the operator would become subject to an NPDES permit.

When an operator agrees to enter into a farm waste management plan, and fails to pursue plan implementation according to schedule, the Department of Ecology and conservation district may take the following actions:

1. The conservation district, after consultation with the Department of Ecology, may agree to extend the negotiated period, but only in those cases where the particular operator has demonstrated considerable progress and improvement in water pollution control but finds that the time requirements were underestimated, or those cases where natural disasters (floods, fire, etc.) have prevented the operator from carrying out his plans on schedule.
2. If the conservation district notifies the Department of Ecology at the end of the negotiated period that an operator is far from achieving his commitment described in the farm plan agreement, he would then become subject to the requirements of an NPDES permit. At that point, depending on the circumstances, he may be subject to penalties as prescribed by federal and/or state water pollution control laws.

#### Informational Packet

An informational packet, containing a variety of materials including a number of publications on management practices and techniques designed to eliminate water quality problems associated with dairy operations, is available at any of the following offices in each county: Cooperative Extension Service, Conservation District(s), and Agricultural Stabilization and Conservation Service. The packet is a supplementary information source for the convenience of those dairymen who wish to review all current literature on the 208 dairy waste management program and on pollution abatement practices. It is intended to supplement the information and technical assistance available on an individual basis from the respective agencies.

#### Agencies Responsible for Program Implementation

##### Department of Ecology

The department, as authorized by EPA, will administer the NPDES permit program within the state. This affects dairies of more than 700 mature animals that discharge pollutants, and other "concentrated animal feeding operations," if dairymen in either category fail to exercise the voluntary options described in the implementation plan to eliminate waste discharges.

The department will identify "concentrated animal feeding operations" of from 201 to 700 mature animals and will refer them to the local conservation district for planning, design, and other technical assistance in solving their respective water quality problems.

Utilizing the services of appropriate local agencies to the extent practicable, the department will maintain a procedure for receiving and responding to complaints concerning dairy waste problems.

In response to complaints concerning the discharge of pollutants from dairies of not more than 200 mature animals, the department will make on-site inspections to determine the validity of the complaints. If a complaint is valid, the department will determine whether the dairy should be designated a concentrated animal feeding operation. Those which are so designated will be referred to the local conservation district for technical assistance in solving the water quality problem.

The department will initiate and participate in an NPDES permit development process with those dairy operators who are discharging pollutants to the surface waters of the state or have potential water quality problems and who have failed to exercise voluntary options which were available to them. In addition, the department may, depending on the circumstances, issue citations and fines.

#### Conservation District

The conservation district, through special arrangements with cooperating federal and state agencies, consistent with available resources, will develop and carry out a continuing information/education program on dairy waste management and the 208 program.

When informed of a waste management problem or when requested by a dairy operator, the district will make an on-site assessment of the problem and suggest a solution. The district will assist the dairy operator in developing a farm waste management plan and implementation schedule for all identified water quality problems at the dairy. Following plan development, the district will provide ongoing technical assistance as needed during plan implementation and, if requested, will assist in the design of waste management facilities. The above services will be provided by district personnel and through special arrangements with cooperating federal and state agencies.

The district will keep the Department of Ecology apprised of progress relative to all dairy operations which had been referred to the district for technical assistance.

#### Washington State Conservation Commission

The Washington State Conservation Commission will provide such assistance as may be consistent with available resources and appropriate to conservation districts in the discharge of their responsibilities in 208 dairy waste management plan implementation.

Through special arrangements with cooperating federal and state agencies, the commission will provide coordination at the state level relative to the working relationships between the various agencies.

The commission will keep the conservation districts informed of the activities and experience of other districts relative to 208 plan implementation, will facilitate an interchange of advice and experience between them, and will help resolve any conflicts that may arise.

The commission will review agreements, or forms of agreements, proposed to be entered into with other public agencies to facilitate 208 plan implementation, and advise the districts concerning such agreements or forms of agreements.

The commission will coordinate district involvement in a statewide information/education program concerning dairy waste management.

#### Agencies Responsible for Providing Supporting Services

##### Cooperative Extension Service

The Cooperative Extension Service is an educational arm of Washington State University in cooperation with each county of the state. Services of both county agents and state extension specialists are available to assist dairymen and other farmers in solving their production and marketing problems. Following are some of the ways in which extension service personnel are prepared to assist dairymen in regard to waste disposal problems:

1. Assist in the interpretation and understanding of federal and state laws and regulations pertaining to discharges of dairy wastes.
2. Organize educational meetings and workshops on the statewide 208 dairy waste management program and serve as discussion facilitators.
3. Provide technical assistance in the development, evaluation, and revision of management practices which are designed to prevent discharge of pollutants from dairy operations.
4. Assist in the design of dairy waste control facilities.
5. Conduct farm tours to study new dairy waste facilities and to compare the effectiveness of different types and sizes.
6. Advise and counsel regulatory agencies on practical considerations due to local conditions which are relevant to program administration.

##### Soil Conservation Service

Technical assistance by Soil Conservation Service personnel is available through local conservation districts. Soil Conservation Service technicians provide assistance in the development of waste management plans, farm conservation plans, and in the design of waste treatment and disposal facilities.

In addition, the Soil Conservation Service provides basic soil, water, and related resource data. It includes maps, inventories, interpretations, technical guides, standards, and specifications for soil and water conservation work.

### Agricultural Stabilization and Conservation Service

The State ASCS Committee has approved federal cost-sharing for twenty-two regular conservation practices. The following approved practices address water quality problems which are associated with dairy and other livestock operations:





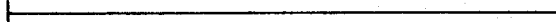


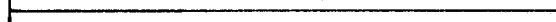
- WP2 Stream Protection
- WP4 Animal Waste Control Facilities
- WP5 Water Management Systems for Pollution Control

Within a particular county, the above practices are eligible for cost-sharing if adopted by the county ASCS committee. The county committee also sets the cost-sharing rate for each practice, subject to state committee approval.

County ASCS committees also have the option, within certain limits, of identifying special conservation practices which are designed to solve local soil or water conservation problems. If approved by the state committee, such practices are included in the county ACP program.

Dairymen are advised to consult their county ACP Program Handbook for information on regular and special conservation practices which are eligible for cost-sharing assistance in the county.

# IMPLEMENTATION SCHEDULE

Plan Tasks	Calendar Year	
	1979	1980
1. CAFO Determination, Farm Waste Management Plan Preparation, and BMP Implementation		
2. NPDES Permit Issuance		
3. BMP Evaluation		
4. Memoranda of Agreement		
5. Education Program		
6. Program Management		
. List of dairies		
. Quarterly progress reports		
. Tracking system		

## PUBLIC PARTICIPATION

Participation of dairymen, agency personnel (federal, state, and local), and dairy specialists during the planning process was achieved in three ways as follows:

1. Use of an Ad Hoc Dairy Industry Advisory Committee.
2. A series of local meetings of dairymen in the principal dairy counties.
3. Four public hearings on the proposed statewide plan.

The ad hoc committee consisted of seven dairymen, two Cooperative Extension Service specialists (agronomist and agricultural engineer), one Conservation Commission staff person, four Department of Ecology technicians, one from the Department of Agriculture Dairy and Food Division, one from the Snohomish County Planning Department, and one representative of the Clark County Conservation District. Dairymen on the committee were selected from different areas of the state.

This committee served as an advisory group throughout the plan development process. Three members of the committee were involved in the development of the Farm Water Quality Manual which describes the BMP which were incorporated in this plan. The full committee had a major input in the development of the implementation plan and the provisions for program management.

Following publication of the first draft of the plan, a series of local meetings of dairymen was held in nine Western Washington and four Central and Eastern Washington counties. County and area dairy agents of the Cooperative Extension Service organized the meetings and served as discussion facilitators. Local staff people from other cooperating agencies helped plan the agendas and participated in the discussions. A total of 20 meetings were held in the 13 counties with attendance totaling nearly 200.

Four public hearings on the Dairy Waste Water Quality Management Plan were held during November 1978 in Spokane, Yakima, Chehalis, and Everett. Written and oral testimony received during this process resulted in changes to the plan. This testimony, in the form of questions or comments, is summarized below.

1. There was concern expressed about the economic impact of plan implementation.

Dairy operators currently have only the ASCS cost-share program to help offset expenses incurred during the correction of an animal waste problem. However, the plan does somewhat compensate for this by allowing two years or more for a dairyman to prepare an acceptable farm waste management plan (with technical help from the local conservation district and SCS representatives) and put that plan into effect. Also, best management practices recommended in the waste management plan will be

those found most cost effective. Finally, the Conservation Commission is working on legislation to secure supplemental funding from the state for conservation districts. This funding, if implemented, is expected to total about \$1 million per year on a statewide basis.

2. Several persons asked why only dairies were addressed in this plan.

The Conservation Commission, in preparation of the plan, found that most beef cattle operations were already under permit. Likewise, most other animal-raising operations are under permit or have not been found to cause a water pollution problem.

There are about 1,700 dairies in Washington State. Many are located near a river or a lake. With few exceptions, any of these dairies failing to employ good waste management practices can cause a water quality problem.

The Department of Ecology has already addressed other major commercial sources of water pollution in the state and is now working on the less obvious, but still significant, agricultural waste runoff problems. It is apparent that a dairy will not produce the waste load of a large industrial operation, but these industrial sources are now under permit and are working to meet limitations on how much wastewater they may discharge. The difference in approach between other commercial operations and dairies is this: a dairyman with a discharge of animal waste requiring an NPDES permit will be allowed at least two years to work out a solution, with help from his local conservation district, and implement it. Only if the dairyman refuses to correct the problem in this manner would he be issued an NPDES permit.

3. There was some confusion as to who would be issued an NPDES permit and what such a permit would require.

Only those dairy operators with a discharge of animal waste from their "confined animal feeding operation" (as defined in federal regulations) and who do not voluntarily correct the pollution problem will be eligible for such a permit. A permit application will only be required if it is evident that an operator is not attempting to solve his animal waste problem in good faith.

If an NPDES permit is issued, it will contain a compliance schedule and a final effluent limitation. The schedule will be prepared on a case-by-case basis. The effluent limitation will be: no discharge of animal waste during anything less than a 25-year 24-hour storm event. These permits are normally issued for a period of five years.

It should be noted that the DOE prefers not to issue NPDES permits and will make every effort, within reason, to solve pollution problems by other means.

4. There was concern expressed that this program would force operators to use management practices that are impractical for their particular situation.

The best management practices (BMP) manual published by the Conservation Commission was taken partially from a similar manual prepared as a part of the SNOMET (Snohomish/King County) 208 plan. These practices were reviewed by members of the Ad Hoc Dairy Waste Advisory Committee and appropriate statewide BMP were selected. While these are the recommended practices, any practice can be designated a BMP if agreed upon by the conservation district and the dairy operator involved. Innovative solutions to dairy waste problems are encouraged.

5. There were questions about DOE enforcement policy.

The DOE prefers that animal waste pollution problems be solved at the local level without state involvement. However, if it becomes apparent that an operator is not acting in good faith to correct a problem, DOE can either issue an NPDES permit or initiate other legal action under state law.

Under state law (Ch. 90.48.090 RCW) the DOE does have the legal "right to enter at all reasonable times in or upon any property, public or private, for the purpose of inspecting and investigating conditions relating to the pollution of, or the possible pollution of, the waters of this state."

Legal action under state law could consist of a civil penalty of up to \$5,000 per day per violation, or an Order which would require that certain action be taken to correct a pollution problem.

6. There was a concern that the plan would result in undue complaints against dairymen.

Due to DOE's limited manning, it has for years relied on complaints as one method of locating water pollution problems. The dairy waste plan simply acknowledges this as one of several potential sources of information.

When a complaint is received, it will be investigated by DOE and/or a representative of the local conservation district. Under the state's Public Disclosure Law (Ch. 42.17.310 RCW), information revealing the identity of persons who file such complaints must not be given out unless the complainant specifically tells DOE his or her name may be given out.

7. Concern was expressed that the plan will conflict with building restrictions in certain areas.

The DOE is aware that there is a potential conflict between the plan and some local building restrictions. The question is currently being researched by DOE's legal staff.

Of concern during development of this dairy waste plan was the implication of "land use control" when agricultural pollution control was contemplated. The development of best management practices for sources of dairy waste implies that certain changes in farming practices may be necessary. The Department of Ecology has taken the position that Section 208 is not a land use control law. It is, rather, part of a water quality law and utilizes best management practices to meet the clean water objectives of this law.

## ENVIRONMENTAL ASSESSMENT

EPA regulations require the preparation of an "environmental assessment" which describes the impact of adopting a water quality management (WQM) plan. To meet this requirement, the following analysis, addressing six major topics, is presented:

1. Description of the existing environment without the implementation of the WQM plan alternatives.
2. Description of the future environment without the implementation of the WQM plan alternatives.
3. Evaluation of alternative elements of the plan.
4. Impacts of WQM plan implementation.
5. Steps to minimize any adverse impacts.
6. Constraints affecting plan implementation.

### Existing Environment without Implementation

- Discharges of pollutants from dairy operations are known to affect water quality in a number of rivers and streams. However, as noted earlier, detailed data is not available on a statewide basis from which to draw specific conclusions on the extent of water degradation due to dairy waste. One can only conclude that dairies are one of several pollution sources.

It is known that dairy waste problems are not peculiar to any particular region of the state. However, there is a higher frequency in Western Washington because the region has a wetter climate and approximately 80 percent of the state's dairy operations. But dairy wastes have been identified as a source, though minor, of water pollution in Central and Eastern Washington as well.

It is not known how many of the estimated 1,700 dairies in the state contribute to water pollution. The evidence suggests, however, that the percentage is small - perhaps as low as 10 percent or less. All other dairymen, for various reasons and through a variety of methods, have made provisions for disposal or recycling of animal wastes.

### Future Environment without Implementation

Dairies of more than 200 mature animals (both milked and dry) are automatically subject to NPDES permit requirements if they fit the legal definition of a "concentrated animal feeding operation." Under existing regulations smaller dairies are also subject to permit requirements if wastes are discharged to waters of the state. This determination is made by the director of the Department of Ecology.

Under proposed revisions to the EPA regulations, dairies will be required to have individual permits or will be included in a general permit

program. Although EPA has not finalized the requirements of the general permit program for dairies, it is likely to include many of the BMP which are outlined in Appendix B.

The WQM plan does not alter the fact that such dairies are required to eliminate any discharges of pollutants. The plan does, however, allow a dairyman sufficient time to correct a pollution problem. It also makes available to him technical assistance through the local conservation district and, in some cases, financial assistance to encourage the adoption of certain approved management practices.

With or without the WQM plan, the future environment is likely to improve for the following reasons:

1. The trend toward larger and fewer dairy operations is likely to continue. This will result in an increase in the number of animals in facilities presently covered by NPDES permit requirements and a decrease in the number of dairy operations which are presently exempt from regulations. If in the future, the NPDES permit system is extended to all dairy operations, additional improvement in the future environment would result.
2. Increased visibility of larger dairy operations coupled with greater public sensitivity to environmental problems will increase pressures for more active enforcement of water quality standards.

#### Evaluation of Alternative Elements

The 208 dairy waste WQM plan is a voluntary sequence of activities inserted in a regulatory program, the NPDES permit system.

In the process of developing the WQM plan, it became apparent rather early that certain plan elements and possible institutional arrangements were so obvious that virtually no serious consideration was given to other alternatives. For example, because of NPDES permit requirements, it was recognized that a positive system of problem site identification was necessary. This led to the development of a combination screening process and complaint system. Department of Ecology's responsibility for the NPDES dictated that the agency assume the lead role in managing these elements.

Because the NPDES is basically a regulatory program, it was obvious that after all voluntary elements of the plan ran their course a provision was necessary to invoke the permit system. DOE was recognized as the only agency having the authority and resources to manage this element.

Between problem identification and NPDES permit development, the Conservation Commission, on the advice of its Ad Hoc Dairy Industry Advisory Committee, developed a series of voluntary plan elements. These contain four basic ingredients: (1) information/education, (2) adequate time to correct a problem, (3) technical assistance in selecting and implementing corrective measures, and (4) financial assistance relative to certain eligible practices.

The above elements required services that existing local agencies were able to provide without departing from their traditional roles. Technical assistance is the primary mission of the SCS through conservation districts. Education is the principal role of the Cooperative Extension Service. Financial assistance is available from the ASCS through their Agricultural Conservation Program.

What we have then, is a WQM plan containing voluntary elements in the middle of a federally-mandated regulatory program (NPDES). All elements of the plan utilize existing state, federal, and local agencies as implementing devices, each performing its traditional role within its present legal framework.

To have considered alternative elements would have required the creation of new agencies or modification of existing ones. It would have resulted in duplication of effort and unnecessary confusion. And not the least of the consequences would be less efficiency and higher costs.

#### Impacts of WQM Plan Implementation

Economic - Dairy operators with water pollution problems face certain economic costs. However, it is the intent of this plan to keep these costs to a minimum. To do this, the plan outlines a cooperative program relying on local experts to solve local problems. The final cost of correcting a dairy waste water pollution problem is left largely to the operator. (Estimated BMP costs are shown in Appendix B - Note that these costs were calculated in 1977 and should be increased by about 20 percent to allow for inflation.)

The economic impact on the individual dairy operator will depend on the productivity of the operation, its present financial condition, and the degree to which the dairy is causing water quality problems. Loan arrangements and interest rates vary with time and lending institution. For instance, a long-term loan from the Farmers Home Administration would have an interest rate of 8-3/4 percent,\* whereas a short-term loan from a commercial bank would carry a rate of between 11 and 12 percent.\*\*

Economic impacts of BMP implementation were calculated during preparation of the SNOMET 208 WQM Plan. This study showed that even though there would be an increase in expenses during the repayment of a loan taken-out for pollution control facilities, decrease in profitability would be experienced only by operators producing low (about 13,000 pounds per cow per year) volumes of milk per cow. In fact, operators producing a high volume of milk per cow were shown to experience no loss of profitability.

Marginal operators might be adversely affected if they are currently creating serious water quality problems. Few would be driven out of business, due to inability to meet the additional costs. The psychological impact could be greater, perhaps causing some marginal operators to give up dairying.

\* Conversation with Olympia Office, FHA, February 22, 1979.

\*\* Conversations with loan officers of Security State Bank (Chehalis) and Federal Land Bank (Chehalis), February 23, 1979.

The economic impact of BMP implementation on the dairy industry should be negligible. The supply of milk will not change significantly. Marginal dairies going out of business would be bought as a dairy or the milk base would be bought by another operator. The farm land itself may be put to other agricultural use, such as truck farming. On the other hand, the land might be converted to suburban residential use. In this case, remaining dairy farms might find their activities more restricted by neighbor complaints about odors or other nuisances. The consumer is unlikely to be affected since milk price is controlled by many factors other than the production cost.

Social - The voluntary nature of this plan should make it more socially acceptable than direct reliance on the NPDES permit program or the state water pollution control laws. An expected social impact of this plan is the avoidance of many potential conflicts between dairymen and other individuals or groups. This will most likely be achieved through early action by dairy operators in solving water quality problems before they become a subject of public concern. Further, it is anticipated that this program will result in almost complete elimination of the necessity for issuing NPDES permits.

Environmental - It cannot be said that this plan will result in a better environment than could be expected in its absence. Vigorous enforcement of the NPDES probably would achieve the same results in the long-term. But it is predicted that this plan will be less costly to administer, more socially acceptable, and likely to result in achievement of 1983 water quality goals more quickly than through a purely regulatory approach.

#### Steps to Minimize any Adverse Impacts

The only significant adverse impact of the WQM plan or the NPDES would be the financial burden on dairy operators who find it necessary to invest in expensive waste management facilities to solve a water quality problem.

The WQM plan would minimize the financial impact by providing both technical services and financial assistance. The financial impact would also be reduced by the additional length of time allowed for voluntary initiative in solving a problem.

Additionally, tax advantages could mitigate the economic impacts to varying degrees, depending on the operation. Investment credits would offset some of the cost during the first year. In addition, pollution control devices approved by EPA and DOE are eligible for an accelerated write-off of the expenditure.

The only existing cost-share program designed for the agricultural community is the ASCS - administered Agricultural Conservation Program (ACP). This program has among its primary objectives the control of pollution from animal wastes. It also encourages voluntary compliance by agricultural producers with state and federal requirements to solve

point and nonpoint sources of pollution. Cost-share funds are available up to a limit of \$3,500 per farm for practices involving the prevention of water pollution by animal wastes.

Although this plan is built around the NPDES permit program, it attempts to temper this federal mandate by allowing adequate time and flexibility in solving pollution problems. In other words, both the dairy operator and DOE have added options in their approach to water quality management.

#### Constraints Affecting Plan Implementation

The major constraint likely to affect the success of the WQM plan is the lack of adequate staffing of the local conservation districts. Success of a voluntary program demands close attention to informational and educational needs, effective coordination among agencies, and a close working relationship with dairymen and their organizations.

Another constraint is the lack of an adequate incentive program. Effectiveness of ACP is reduced by an inflexible cost-share limit per farm. Referendum 26 funds, administered by the Department of Ecology, cannot be used for individual cost-sharing. The Rural Clean Water Program (RCWP), once thought to be a promising source of cost-share funds, is not at this time a realistic possibility.

APPENDIX A

Sample Memorandum of Agreement

## APPENDIX A

### SAMPLE MEMORANDUM OF AGREEMENT

#### MEMORANDUM OF AGREEMENT

between

The Department of Ecology,

The \_\_\_\_\_ Conservation District  
and

The Washington State Conservation Commission  
relative to

#### Dairy Waste Management

The Conservation Commission is an agency of state government organized under Chapter 90.08 RCW and is responsible for administering the legal and program activities of conservation districts. Conservation districts are entities of state government, under Chapter 90.08 RCW, and are responsible for the conservation and development of natural, renewable resources within district boundaries.

The purpose of this Memorandum of Agreement is to coordinate the functions of the Conservation Commission, the Department of Ecology (DOE), and the \_\_\_\_\_ Conservation District in carrying out a program of dairy waste management under Section 402 of Public Law 95-217, and EPA regulations of March 18, 1976.

The Department of Ecology will:

1. Identify existing or potential animal waste problems on dairies of more than 200 animal units.
2. Receive, process, and verify complaints concerning discharge of pollutants from all dairies regardless of size.
3. Contact the appropriate conservation district when a dairy waste problem is identified.
4. Inform the dairyman on whose farm a pollution problem has been identified that the district has been informed of the problem, that it can provide planning and other technical assistance, and that it will contact the dairyman to offer such assistance.
5. Upon determining that a dairy waste water quality problem warrants immediate corrective action, require such action be taken under the Washington State Water Pollution Control Laws (Ch. 90.48 RCW) and the Washington State Water Quality Standards (Ch. 173-201 WAC). In all cases, the appropriate conservation district will be notified of such a determination as soon as possible.
6. Continue to administer and enforce existing NPDES discharge permits for operators of concentrated animal feeding operations where required.

7. Enter into a formal NPDES or state enforcement process with a dairy operator in the event of:
  - a. Notification by the conservation district that such operator is an unwilling participant in the voluntary program (i.e., one who refuses to enter into an approvable plan within 6 months following notification to the conservation district that a dairy waste problem exists).
  - b. Notification by the conservation district that such operator, within the negotiated implementation period or an approved extension thereof, has failed to correct the water pollution problem.

The Conservation District will, consistent with available resources and through special arrangements with cooperating federal and state agencies:

1. Receive and verify complaints concerning discharge of pollutants from dairies and refer to the Department of Ecology for further investigation.
2. Make an on-site assessment of a waste management problem when requested by the Department of Ecology or by cooperators.
3. Assist the cooperator in development of a farm waste management plan and implementation schedule.
4. Provide technical assistance as needed during plan implementation.
5. Monitor plan implementation and inform the Department of Ecology of its completion.
6. Notify the Department of Ecology in the event a dairyman either refuses to enter into a farm plan to correct a dairy waste problem or, within a negotiated period, has failed to meet the commitments of a farm plan to correct the problem.
7. Notify the Department of Ecology of any adjustments in the agreed schedule for implementation of a dairy operator's waste management plan.

The Conservation Commission will, consistent with available resources:

1. Provide such assistance as may be appropriate to the conservation districts in the discharge of their responsibilities as management agencies in 208 dairy waste plan implementation.
2. Provide coordination at the state level through special arrangements with appropriate federal and state agencies.
3. Coordinate the programs of the respective districts as related to plan implementation and resolve any conflicts in such programs.

4. Inform conservation districts of activities and experiences of other districts relative to 208 plan implementation, and facilitate an interchange of advice and experience between such districts and cooperation between them.
5. Maintain an ad hoc dairy industry advisory committee to review annually and to update when necessary the 208 Dairy Waste Management Plan.

This agreement may be terminated by any party hereto on the last day of October of any year upon serving six (6) months written notice upon the other two parties. Such notice shall be mailed to the principal executive officer of the other two parties by certified mail, postage fully pre-paid, and shall be deemed served the day after depositing such notice in a United States Post Office.

Amendments may be made to this agreement at any time only upon the written agreement of all parties hereto.

This agreement contains all the terms and conditions agreed upon by the parties. No other understandings, oral or otherwise, regarding the subject matter of this agreement shall be deemed to exist or to bind any of the parties. All parties have read and understand the above contract and now state that no representations, promises or agreements not expressed in this agreement have been made to induce the other to execute the same.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed on this \_\_\_\_ day of \_\_\_\_\_, 19\_\_.

ATTEST:

DEPARTMENT OF ECOLOGY

\_\_\_\_\_  
Assistant Attorney General

\_\_\_\_\_  
Assistant Director  
Office of Field Operations

CONSERVATION COMMISSION

\_\_\_\_\_  
Executive Secretary

\_\_\_\_\_  
CONSERVATION DISTRICT

\_\_\_\_\_  
Chairman

APPENDIX B

Farm Water Quality

(BMP)

Management Manual

Snohomish County Metropolitan  
Municipal Corporation/King County 208  
Areawide Waste Management Planning Study

## **Farm Water Quality Management Manual**

prepared by  
URS Company

study participants  
Snohomish County  
King County  
City of Everett

September 1977

P-000091

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# Acknowledgements

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Snohomish Conservation District Board of Supervisors

King County Conservation District Board of Supervisors

SCS District Conservationists: By Taylor and John Edwards

County Extension Service Agents: Dick Mathews and Woody Bernard

Snohomish County Planning: George Sherwin, Jr., Director; John Galt, 208 Project Manager; Bill Lum, Project Planner; Jay Grinols, Planning Technician; Jan Palmer, Public Participation Coordinator.

King County Planning: Rod Sakrison, Project Planner

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The 208 staff extends a special thank you to the farmers of Snohomish and King Counties, especially those who served on the SNOMET/King County 208 Ag Working Committee. All have provided extensive input to and continued support of the management program presented in this manual.

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# Introduction

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This manual is designed to assist the farmers of the SNOMET/King County 208 Areawide Waste Management Study Area in developing farm management practices which will improve the quality of the area's surface waters, while increasing the productivity of its croplands.

As a result of an increased understanding of the effects which uncontrolled runoff has upon water quality and the fertility of the soil, positive steps are being taken to prevent such degradation and unnecessary loss of nutrients from the soil. The waste management planning currently underway is an outgrowth of Public Law 92-500, passed by Congress in 1972. This law is intended to protect the nation's water bodies and their tributaries from pollution. Section 208 of this law deals specifically with reducing the non-point sources of pollution; that is, pollution which reaches surface waters through non-discrete discharges.

The ultimate responsibility for ensuring compliance with PL 92-500 rests with the United States Environmental Protection Agency and the Washington State Department of Ecology.

However, the SNOMET/King County 208 program was established to respond to this law at the local level, and has been working in association with the County Extension Agencies, the Soil Conservation Service, and five agricultural producer representatives to develop this manual. Through this combined effort, the "Farm Water Quality Management Manual" has evolved.



# Chapter 1

## Best Farm Management Practices

---

Three criteria were the basis for developing the "best management practices" presented in this manual:

- They must be economically feasible for the operator to implement
- They must have citizen and operator support, and
- They must result in improved water quality.

The "best management practices", hereafter referred to as BMP's, are intended to be possible alternatives to the farmer for improving his waste management procedures. Each farming operation is unique and requires its own method of reducing or eliminating water pollution problems. For this reason, "best management practices" are suggested here for various different types of problems.

In consultation with their local Conservation District or County Agent, each farm operator can determine if BMP's are required, and if so, can select the BMP or combination of BMP's which will be compatible with his operation and circumstances.

There are many farms which already do an excellent job of protecting water quality. For example, this is being accomplished by isolating animal confinement areas from ditches or streams and not allowing runoff to enter these waterways. In such cases, the farmer need not be concerned with runoff control measures such as roofing.

The BMP's are divided into six major areas to assist you in finding the appropriate BMP's for your particular situation. Under each of these six major headings is a discussion of various problems and several solutions to each of these problems. The six major areas are:

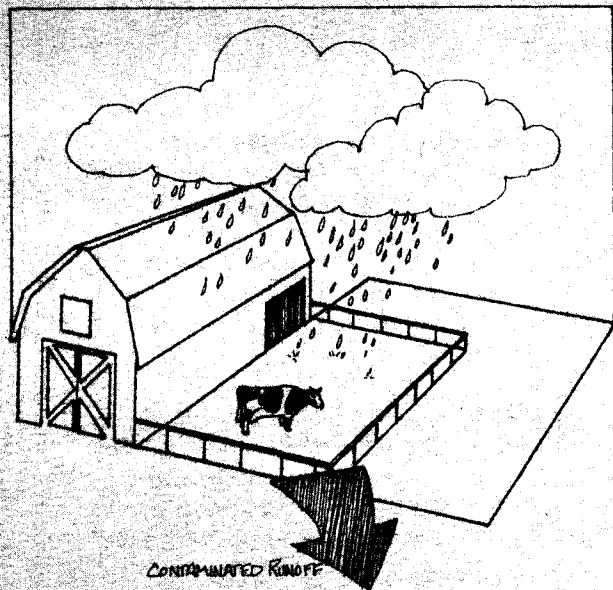
- Confinement Areas
- Manure Application
- Pasture Situations
- Commercial Fertilizers
- Silos
- Farm Product Processing Plants

## Confinement Areas

The trend in modern dairy and beef cattle raising practice has been toward larger and more efficient operations. Quite often this has meant the keeping of large numbers of animals in relatively small areas such as feed lots or confinement areas. In many cases, the animals spend virtually all their time in a single location and feed is brought to them. While such a practice may be more efficient for the farmer than grazing the animals in open pasture, it also increases the chance of serious water pollution. Runoff from the cement slabs normally found in such operations is highly contaminated with manure and can result in serious water quality problems and potential health hazards if allowed to reach a ditch or a stream. The total capture and proper handling of such runoff becomes an imperative part of the total farm operation.

### Problem 1

Large quantities of manure contaminated water from confinement areas are difficult and costly to handle and dispose of. By reducing the quantity of water to be handled, direct discharge of manure or manure contaminated water into ditches or streams can be prevented. The following four solutions will help prevent confinement area runoff from being a problem.



## Solution A

### Roof Confinement Areas

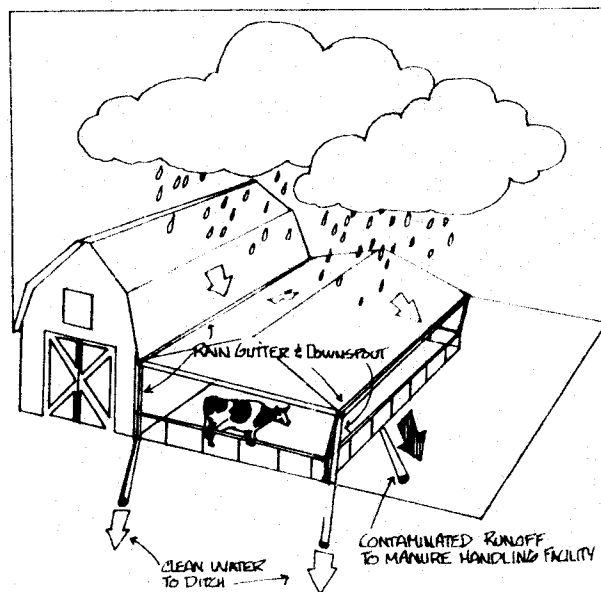
By roofing the entire confinement area, the clean runoff from the roof can be separated from the contaminated slab runoff. Roof gutters and a rain collection pipe system should be installed when the roof is built. This practice will considerably reduce slab runoff and the uncontaminated roof runoff can be channelled to the nearest ditch or to the washdown or watering system for use. Any slab runoff will result from washdown practices and should be channelled to a manure handling facility.

#### Advantages

Three to four feet of rain falls every year in most of Western Washington. This means that for every acre of open confinement area, over one million gallons of contaminated water is created every year. This water, in addition to an approximately equal amount of washdown water used, means that close to 2 million gallons of contaminated water per acre of open confinement area must be handled and disposed of each year. Roofing the confinement area and installing piping systems will significantly reduce the amount of water which must be handled. Also, by using the uncontaminated runoff for watering or washdown, cost savings can be realized.

#### Disadvantage

Roofing is costly to build, especially if the confinement area is large. There may be a tendency to go to a smaller confinement area, which would result in more sanitation problems. However, if a storage lagoon is to be used, a smaller lagoon is needed for a roofed area than for an unroofed confinement area. This will partially offset the cost of roofing. Also, downspouts and drain lines need to be protected from damage by heavy equipment.



Cost

\$1.50 – \$1.75/ft<sup>2</sup>

This could be less if the side of an existing structure is used for roof support. (Also refer to Problem 2, Solution A for costs to build containment structures.)

## Solution B

### Minimize Washdown Water Usage

To minimize washdown water usage, use the minimum amount of water consistent with sanitary requirements. Scraping manure prior to hosing and substituting higher pressure for volume will allow a minimum of water usage.

#### Advantage

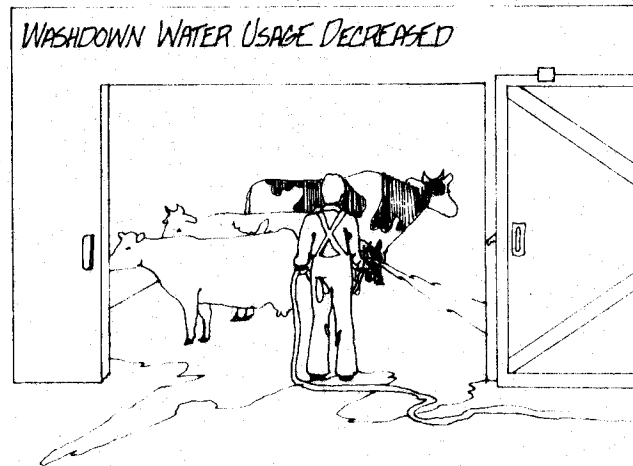
This practice reduces water costs and the amount of water which must be handled.

#### Disadvantage

None

Cost

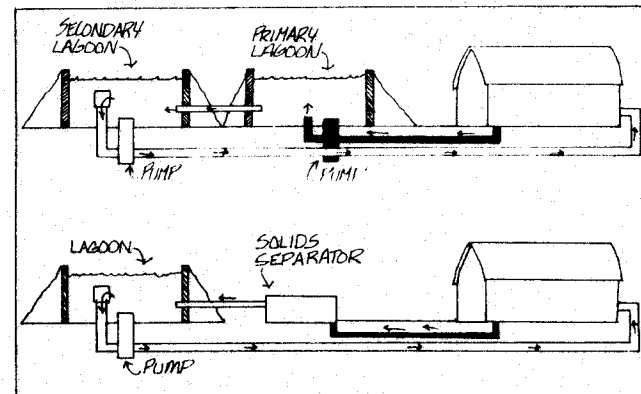
None



## Solution C

### Reuse Washdown Water

With a minimum of treatment, washdown water can be recycled a number of times. A system must be built where solids can be separated out and the water placed in a storage structure such as a tank or lagoon. An alternative to this is to have two lagoons; the first lagoon, called a primary lagoon, to settle out solids, with an overflow pipe leading to a secondary lagoon from which water may be recycled. A pump should be located at the place of storage to pump the water through a piping system back



to the confinement area. The intake to the pump should be elevated away from the bottom and sides of the storage structure to prevent clogging of the system with residual solids.

#### Advantages

Water reuse reduces the volume of new water which must be handled and disposed of, reducing storage requirements and operating costs.

#### Disadvantage

Water reuse is not practical in a situation where a lagoon or other storage structure does not exist. An additional cost is incurred because of the need to construct a waste handling and water reuse system. Also, an odor problem may arise from the pumped reuse water, particularly if solids are not separated out ahead of the lagoon.

#### Cost

\$20,000 — \$40,000 for a storage and pumping system.

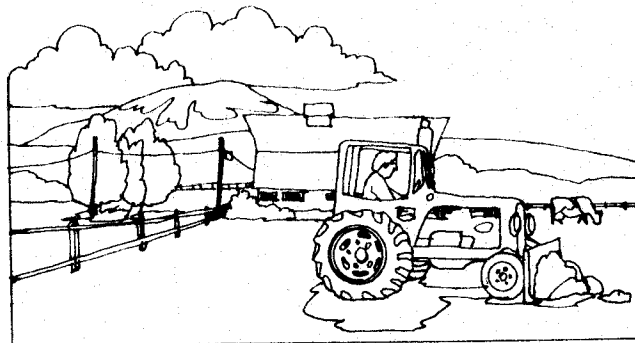
### Solution D

Handle Manure from Dry Cows and Heifers in Solid Form

It may be practical on some farms to handle wastes from dry cows and heifers in a solid form, rather than as a liquid. Dry cows and heifers may constitute as much as one half of the total herd, consequently, a substantial reduction in the volume of contaminated water can be achieved by handling this portion of the manure in a solid state.

#### Advantage

There will be a significant reduction in wastewater.



### Disadvantage

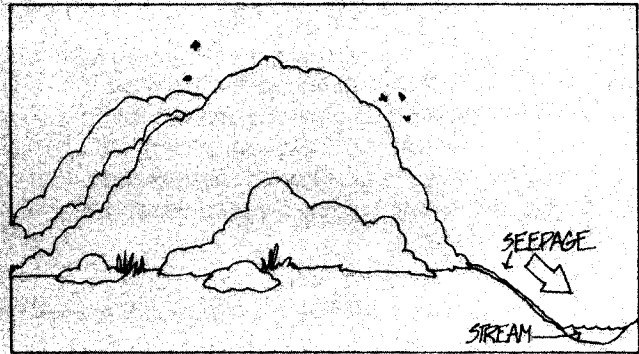
This system may require somewhat more labor than liquid waste collection. It also requires a separate area to store the manure. (See Problem 2, Solution A under CONFINEMENT AREAS).

### Cost

Depends upon present layout of confinement area.

### Problem 2

Seepage from stacked, solid manure results in water pollution. Walling in the manure storage area and/or roofing it will help eliminate this undesirable condition.

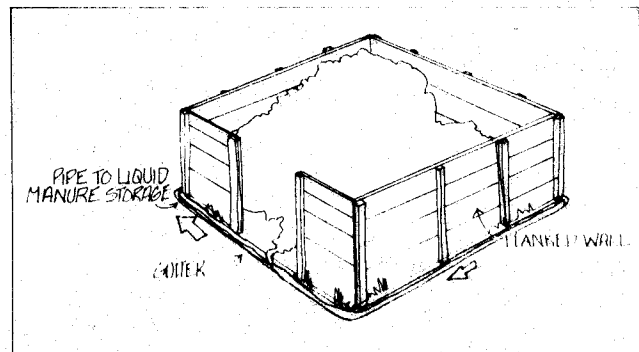


### Solution A

Construct a Walled Storage Area

Construct the stacking area to contain the manure on-site. Even solid-state manure will tend to ooze and move beyond the point of placement. A containment wall of concrete or tightly fitted wooden planks can hold the manure in place and also make subsequent removal with tractor loaders a much easier task.

Seepage can be controlled by (1) collecting it in a drain and channelling it off to a liquid manure storage area, if one exists, or (2) constructing a berm near the point of exit from the stacking area and allowing the seepage to collect and sink into the ground. A berm



should not be used in an area with highly permeable soil where groundwater contamination might occur.

To determine the size of the storage area needed, calculate the daily volume of manure by using the figures of 1 cu. ft. per head of beef cattle and 1.3 cu. ft. per dairy cow.

#### Advantage

By properly storing dry manure, more of its potential as a fertilizer and soil conditioner can be realized and its threat as a water contaminant eliminated. Dry stacking is an efficient way to store large quantities of manure until conditions are favorable in the field for spreading. It is a particularly feasible alternative for most beef operations.

#### Disadvantage

Use of this method requires the building of a containment structure and is not feasible at many dairies because of the liquid nature of the waste from producing cows.

#### Cost

\$50/yd<sup>2</sup> if concrete slab is laid. The cost of planked walls can vary from five hundred to several thousand dollars, depending upon the size needed and the amount of labor provided by the farmer.

## Solution B

### Roof the Stacking Area

Roofing will greatly reduce the amount of runoff and seepage from manure holding areas, including stacking areas.

#### Advantage

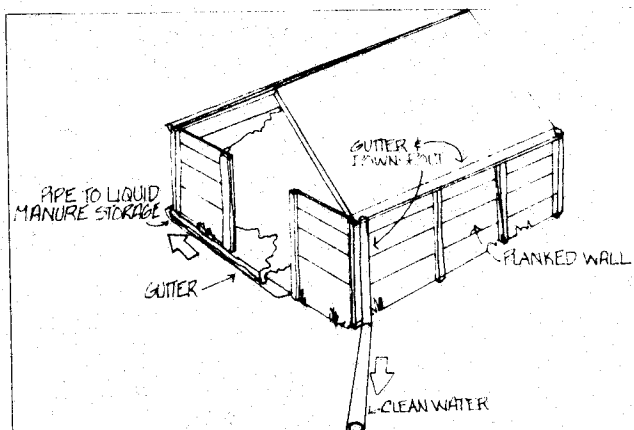
There is a great reduction in the volume of manure seepage. With a hollowed-out dirt floor and a roof, seepage from a manure stack may be eliminated entirely in some cases.

#### Disadvantage

The roof adds a cost to the farming operation.

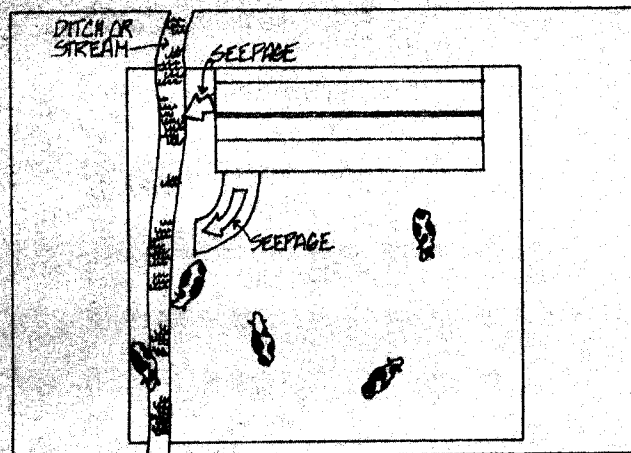
#### Cost

\$1.50 – \$1.75/ft<sup>2</sup> of roofing.



## Problem 3

Seepage from confinement areas located adjacent to streams or ditches can cause health and water pollution problems and also results in a loss in the nutrient value of the manure.



## Solution A

### Relocate Confinement Area

The confinement area should be moved to a site removed from surface water, preferably a distance of 50 to 100 feet or more from the water.

#### Advantage

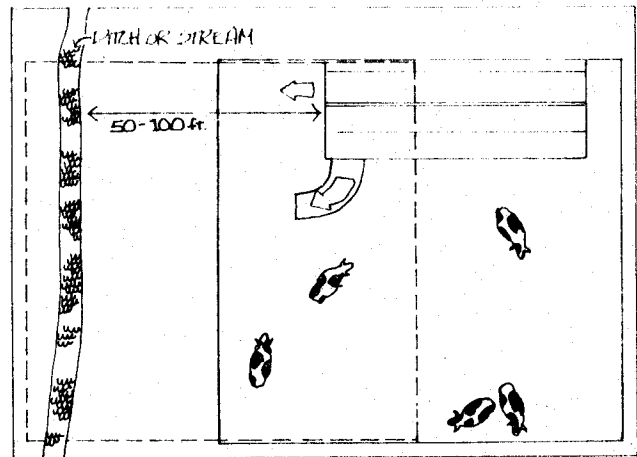
The probability that confinement area runoff will reach a stream or ditch is greatly reduced, especially if the intervening distance is grassed.

#### Disadvantage

Relocation is very costly, particularly for larger operations. It is most feasible for small operators with a minimal facility investment. It is, however, an option which should be considered by any operator who is considering reconstructing a major portion of his confinement area.

#### Cost

Several thousand dollars, depending upon the size and complexity of the confinement area.



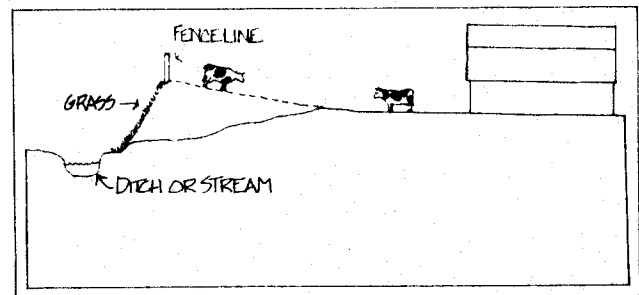
## Solution B

### Regrade Confinement Area to Slope Away From Surface Water; Fence Animals Away From Water

To prevent the escape of pollutants, the confinement area should be built up and graded away from the ditch or stream. Animals should be fenced no closer to the stream or ditch than the top of the grade. Exposed soil on the ditch slope should have a grass cover.

#### Advantage

Pollutant runoff is reduced or eliminated, and



the streambank does not suffer damage from hooves, therefore reducing erosion potential.

#### Disadvantage

Regrading can be costly and is only feasible for dirt confinement areas. Water must be provided to the animals.

#### Cost

Wire fencing would cost about \$.50/lineal foot. Dirt and grading would cost one to two dollars/yard<sup>3</sup>, depending upon the distance which the fill dirt must be hauled.

### Solution C

For Hard Surfaced Areas, Construct A Runoff Barrier and Fence Animals Away From Water

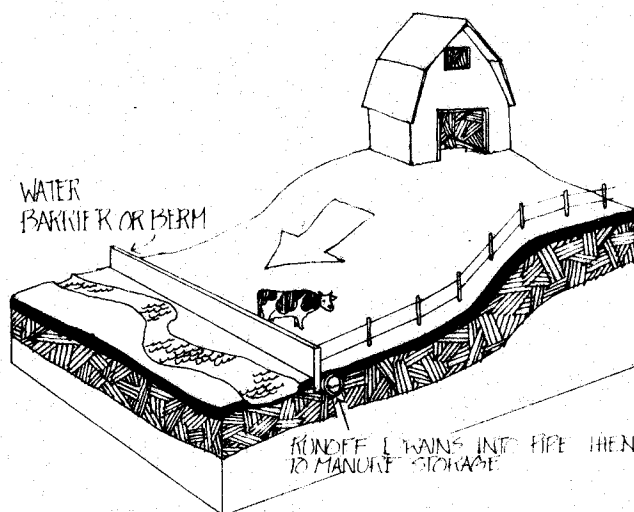
A berm, or runoff barrier, should be constructed parallel to the stream at the edge of the confinement area. The runoff should then be channelled into a collection area. A pump may be needed to remove this water to storage. As in Problem 3, Solution B under CONFINEMENT AREAS, the animals must be fenced away from the stream.

#### Advantage

Pollutant runoff from the confinement area is reduced or eliminated. It also protects the streambank from hoof damage and erosion potential.

#### Disadvantage

A moderate investment is required. Some methods of animal management may have to be altered somewhat and water provided to the animals by other means.



### Cost

Several hundred to several thousand dollars. This depends upon the size of the confinement area and whether intercepted water can flow or must be pumped to the manure handling facility.

Fencing costs would be approximately \$.50/lineal foot.

### Solution D

If Confinement Area is Adjacent to Ditch, Use Piping to Transport the Water

That portion of the ditch flow immediately alongside the confinement area, plus a sufficient distance on either end can be channelled through an underground pipe to prevent runoff into the ditch. This pipe should be non-porous and sized to accommodate the peak storm flow in the ditch. The runoff, if not excessive, will run over the land and eventually percolate into the ground.

### Advantage

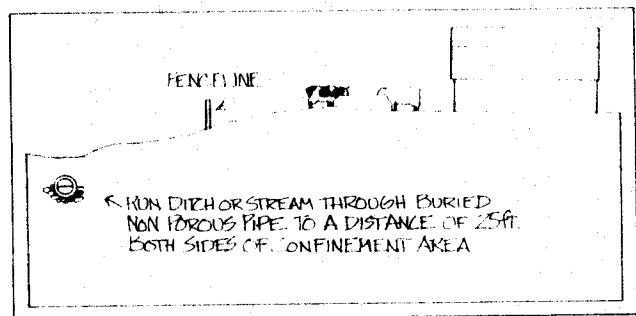
This is a quick, relatively inexpensive way to eliminate the flow of confinement runoff into an adjacent ditch.

### Disadvantage

A cost will be incurred to purchase the pipe and install it. If runoff is excessive, a muddy area or ponding may occur during periods of intensive rainfall. Maintenance may be required due to plugging of the lines and root intrusion.

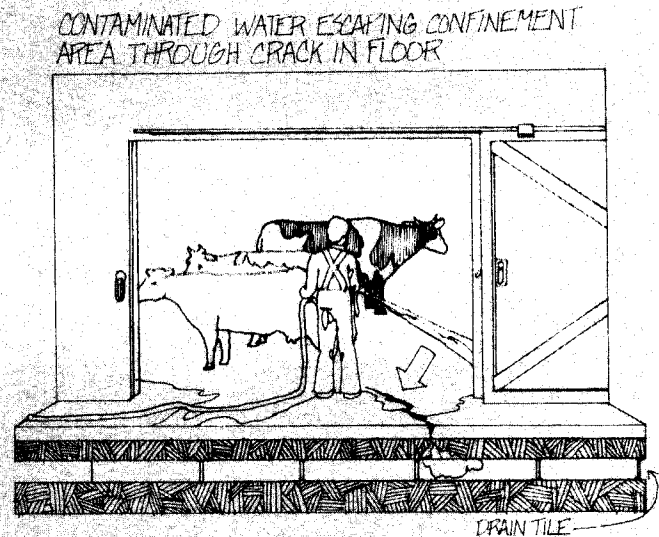
### Cost

1. Corrugated aluminum pipe:
  - 1 ft. dia. \$2.00/ft.
  - 2 ft. dia. \$5.00/ft.
  - 3 ft. dia. \$9.00/ft.
2. Hydraulics Permit.



#### Problem 4

Contaminated water escaping into the waterways from gaps in the confinement area's collection system can seriously pollute nearby waterways.



#### Solution A

##### Seal Contaminated Leaks

Plugging or sealing leaks in the collection system will remedy the problem of escaping pollutants. This will redirect the water flow to the storage or treatment area. Occasionally, regrading the confinement area or piping water out of low spots may be necessary.

##### Advantage

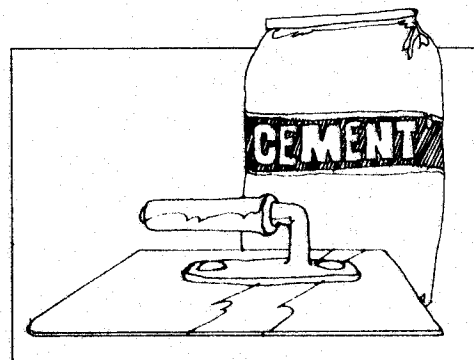
Small, remedial maintenance measures may be all that are necessary to eliminate pollutant sources such as these.

##### Disadvantage

In some cases, considerable expense and/or work is required to eliminate or collect runoff to an isolated sump within the confinement area.

##### Cost

There is minimal cost to the farmer.



## Solution B

### Divert Clean Runoff from Confinement Areas

The flow of clean water from adjacent fields and slopes should not be allowed to enter confinement areas and become contaminated. Interceptor ditches or other barriers should be used to divert clean water runoff from confinement areas.

#### Advantage

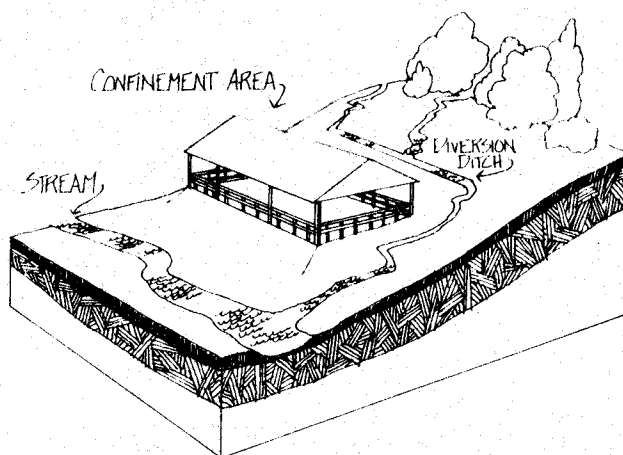
Avoiding contamination of clean runoff decreases the volumes of contaminated water to be treated.

#### Disadvantage

None.

#### Cost

Ditches or barriers can be dug or built by the farmer so cost is minimal.



## Problem 5

Farms with small storage capacity for liquid manure and associated wastes must spread frequently or the reservoir will overflow. During the rainy winter months, many fields become saturated, which results in ponding. Manure applied under these conditions will likely flow off the field, resulting in contaminated surface water and the loss of a valuable resource. The objective here is to eliminate the conditions which cause this runoff situation.



## Solution A

### Construct a Confinement Area Drainage System and Lagoon

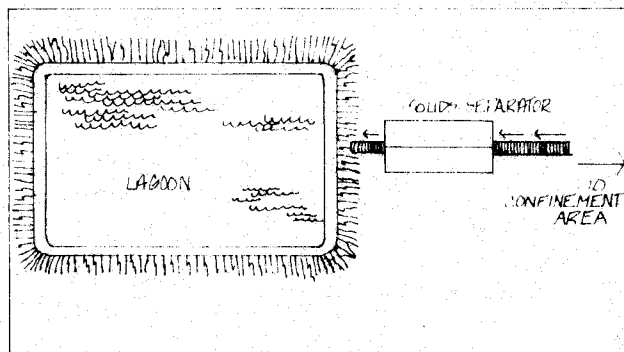
Farms having fields with drainage problems

in the winter will find long term storage of liquid manure to be the best solution. The manure can then be applied during periods when the water table has receded. Considering current costs of construction, lagoons appear to be the best approach to long-term storage of large volumes of liquid manure.

The size of the lagoon will depend upon the size of the operation and the length of storage needed. Some farms have saturated fields for the full length of the wet season, October through April. Others may experience only occasional, short-term saturation problems, thus requiring smaller storage capacity. A separate determination should be made for each affected farm in consultation with the local Conservation District.

Specific design information for lagoons is given in Washington State University Extension Bulletin 655, "Lagoons for Livestock and Poultry Waste", which can be obtained from a local extension agent.

Where feasible, the farmer should consider installing a solids separator ahead of the lagoon. This has several advantages: (1) it will greatly reduce or eliminate the need to clean out the lagoon periodically, (2) it reduces the storage volume needed for the lagoon, and finally, (3) odor problems are lessened if the solids are removed first. Removed solids can be dry stacked (see CONFINEMENT AREAS, Problem 2, Solution 1) and field spread with a beater-spreader whenever field conditions permit. If a solids separator is installed, it should not be operated during the first 4-6 weeks of the life of the lagoon. The solids form an excellent seal in the lagoon to hold in the water.



#### Advantage

A lagoon provides the necessary storage for large volumes of liquid manure and contaminated water to allow its application during suitable dry periods. The liquid is applied by pump and spray nozzle which requires a minimum of labor. Manure applications need to be made less frequently due to the increased storage capacity, thus reducing labor time. And finally, large lagoons allow the farmer to apply the manure in the spring and early summer when the fertilizer value of the manure can be most effectively utilized. This is the single most effective way to eliminate major water pollution problems associated with confinement areas.

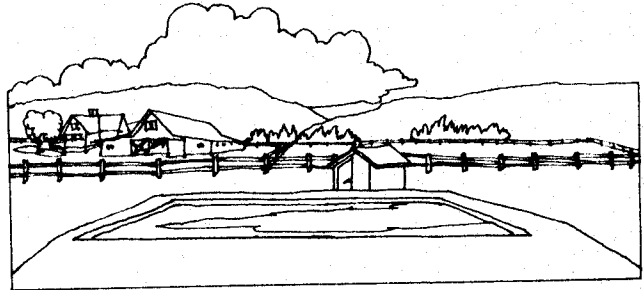
Also, separated manure solids can be used for bedding material or sold as a soil additive. This makes land available which may have been saturated and unusable previously.

#### Disadvantage

Lagoons and their associated solids separators are costly to install. The larger lagoons can take an acre or more of farmland out of production. While few odors will develop from an undisturbed lagoon, a considerable odor problem can develop for a day or so during and after land application. The problem can be avoided by direct soil injection of manure, but this approach is not always practical. Finally, a lagoon is open to the weather, requiring several extra feet of depth to store rainfall.

#### Cost

Excavation of a lagoon will cost from \$.30 to \$.50/yd<sup>3</sup>. A solids separator will cost from \$6,000 to \$10,000. The total price, including the separator, can be expected to run from \$30,000 to \$50,000 for a large dairy opera-



tion, depending upon the amount of labor contributed by the farmer.

### Problem 6

Manure stored for long periods of time in a lagoon may cause serious odor problems when applied to a field. Odor problems should be considered when selecting a type of storage and handling facility in order to avoid complaints from surrounding residents.



### Solution A

Follow Prescribed Steps for Manure Application

- (a) Spread manure when humidity is relatively high and soil is wet, but not so wet that runoff occurs.
- (b) Spread manure when wind is blowing away from potential complaint areas such as residential developments.
- (c) Do not spread during air inversions. Under such conditions, odors will stay near ground level and not disperse.
- (d) Do not spread during early morning, evening, or at night.
- (e) Agitation of manure tanks or use of an aerator in lagoons will reduce, but not eliminate odors.
- (f) If spreading is required in close proximity to potential complaint areas, use the plow-furrow-cover method or a manure tank wagon equipped with soil injection equipment.
- (g) Install a solids separator to remove solids before they enter manure tank or lagoon.

#### Advantage

These methods will reduce or eliminate the odor problems due to manure application from a lagoon.

#### Disadvantage

Except for (e) and (f) the potential for odor still exists. Solids separators are costly to install and aerators require large amounts of energy. Soil injection requires firm ground for equipment operation and may not be practical in many low-lying areas during the winter. Solutions (a) through (d) have no inherent disadvantages except proper timing of manure application to coincide with optimal conditions.

#### Cost

For methods (a) through (d) there is no cost, only an increased awareness by the farmer is needed. Methods (e), (f) and (g) require purchasing special equipment, unless these things are already in use by the farmer.

### **Solution B**

#### Manure Storage Tanks

For operations which only require short-term storage or for relatively small operations, a manure tank may be desirable.

#### Advantage

A manure tank can be installed quickly and in locations generally more convenient to the confinement area than a lagoon.

#### Disadvantage

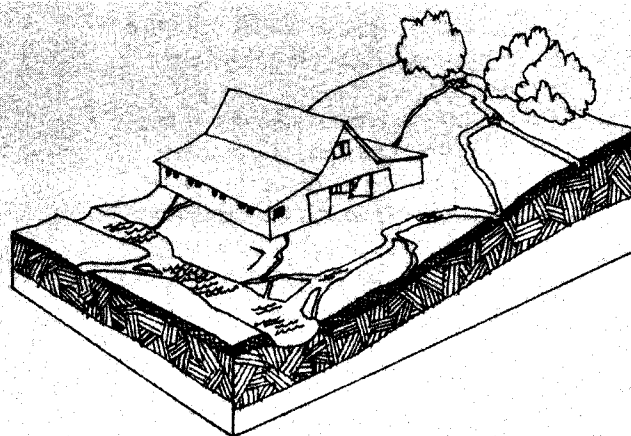
For medium to large operations, long-term storage in tanks is more costly than lagoons, due to the requirement for a very large tank.

### Cost

Installed manure tanks will cost approximately \$0.25 per gallon capacity for a 35,000 gallon tank. Smaller tanks will cost somewhat more per gallon.

### Problem 7

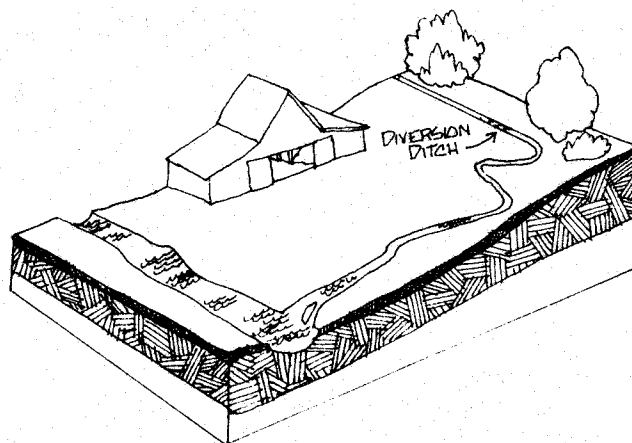
Numerous water channels running across a farm increase the likelihood for pollutant escape from the farm.



### Solution A

#### Redirect Water Channels Around the Farm

In some cases, the rechanneling of smaller waterways into main waterways which skirt or bypass agricultural operations may prove to be a practical solution to major water quality problems. Although not usually feasible for a single farm, it may be possible for several farms to join together to reroute a waterway around local agricultural areas. However, before diverting a stream, the local office of the State Game Department must be consulted in order to assure that undue disruption of the stream habitat does not occur, and a hydraulic application is filled out. The Department of Ecology must also be assured that all downstream water rights will be preserved.



### Advantage

Diversion of waterways to avoid contamination is likely to be far less expensive than construction of elaborate storage and treatment facilities for contaminated runoff.

### Disadvantage

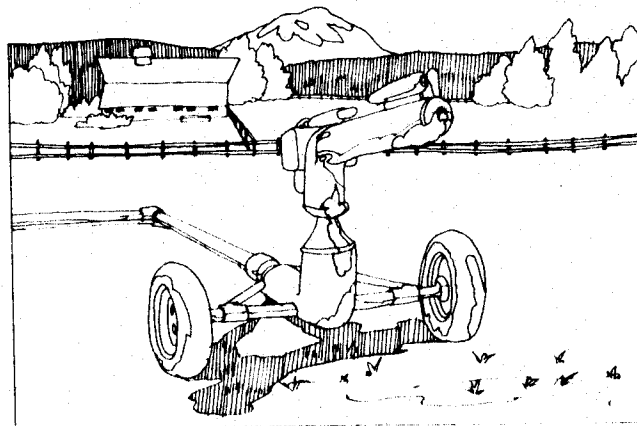
There are costs incurred in digging a new channel. The Fish and Game Department may not allow diversion of a stream if it supports a migratory and/or resident fishery.

### Cost

It will cost \$1.00 to \$2.00/yd<sup>3</sup> of earth excavated for the new channel. The cost is largely dependent upon the distance which the earth must be moved to fill in the old channel. Also, a hydraulics permit must be obtained for rechanneling.

## Field Application of Manure

Today's high density farming operations have complicated the problem of manure utilization and management. Various disposal methods have been examined in recent years, but spreading the manure on the land is the most practical and beneficial method. There is general agreement among research scientists, extension workers and farm operators that manure can, and should, be used in crop production. Nutrients from manure and organic matter, applied in proper amounts, can improve crop yields and soil fertility. Efficient use of this resource can result in substantial savings of energy. It is estimated that 95% of the manure produced in Washington State is returned to the land on the farm where it was produced.

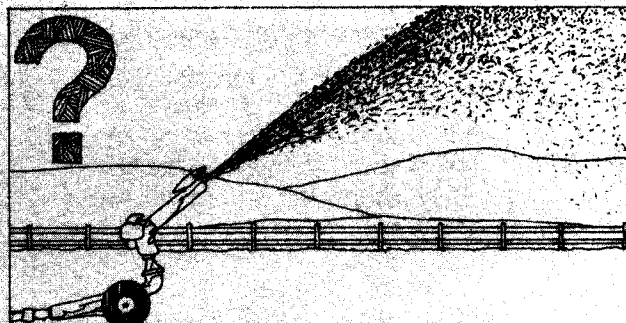


While manure is a valuable fertilizer, careless handling of it can degrade the quality of surface or groundwaters, disseminate diseases, cause nuisance odors, or impair the ability of the soil to produce good crop growth.

The development of any manure management practice should be designed to minimize pollution from manure storage and maximize the conservation of plant nutrients for crop production.

### Problem 1

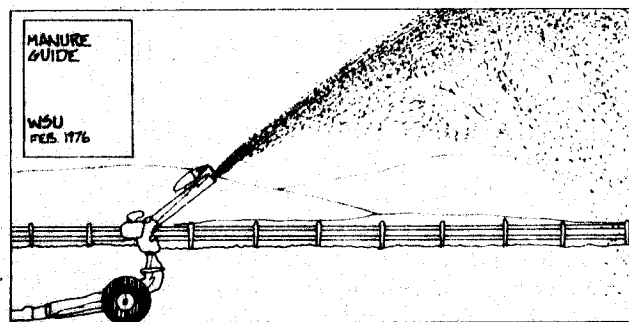
How much manure can a given parcel of land take?



### Solution A

Apply Manure According to the Nitrogen Requirements for the Crop

Manure loading rates are normally based on the amount of nitrogen (N), as it is the most mobile nutrient of those considered to be pollutants. Loading rates are given in "Guidelines for Manure Application in the Pacific Northwest", published by the Washington State University Extension Service in February 1976. These guidelines should be followed, and can be obtained from a local county extension agent.



Manure storage and handling, N losses, soil acceptance capabilities, and crop requirements for N are discussed in this publication. Because the guidelines for manure loading

rates are related to crop removal of nutrients, operators who use these should not have excessive leaching of nitrogen and phosphorus through the soil profile to groundwater or for subsequent entry into waterways.

#### Advantage

Manure applied in this manner yields the maximum nutrient values and overloading of the crop is generally avoided.

There are no costs or disadvantages to the farmer.

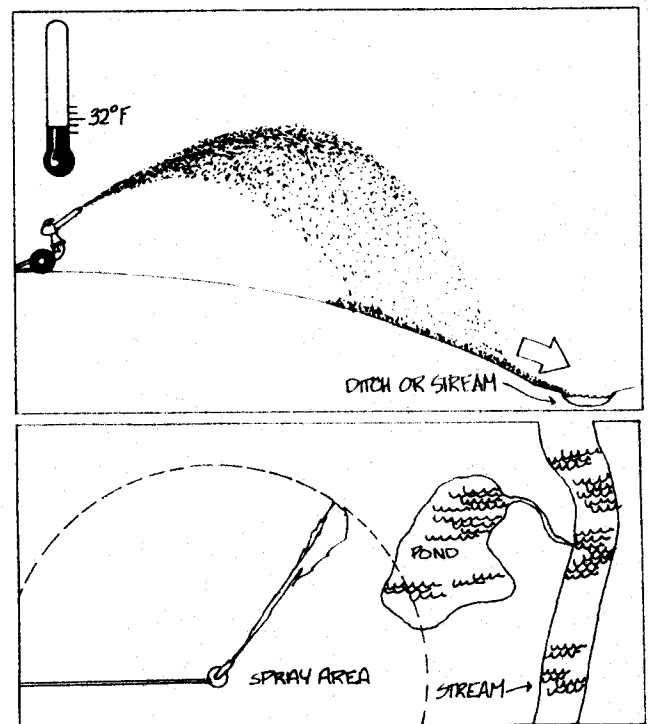
### Problem 2

Incorrect application of manure can result in flow off the field and into a ditch or stream.

### Solution A

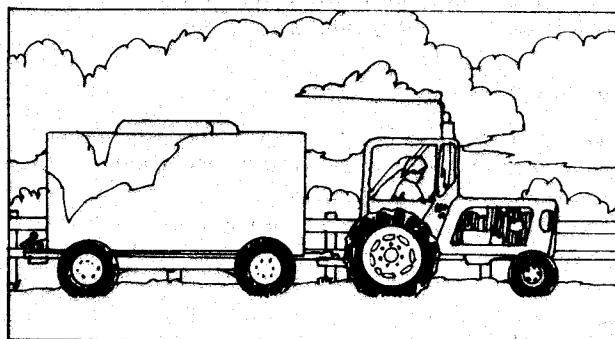
#### Avoid Certain Situations

- (a) Avoid spreading on sloping fields which are frozen or covered with snow.
- (b) Do not spread in fields with ponded water if these ponds drain directly into streams, ditches or groundwater.
- (c) Avoid sealing the soil surface by applying manure slurry which is not too high in suspended solids. As a general rule, applications to forage stands of manure slurry with 5% suspended solids should not exceed 1½ inches within a 30 day

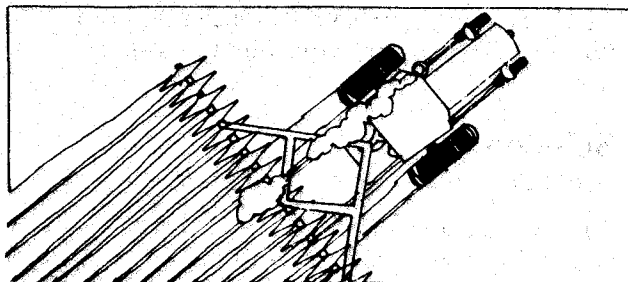


period. Suspended solids will range between 4% and 6% on most dairies if a solids separator is not used.

- (d) Do not compact soils by allowing heavy vehicular traffic on them when they are wet. Soil compaction reduces infiltration rates and thereby increases the possibility of excessive surface flow.



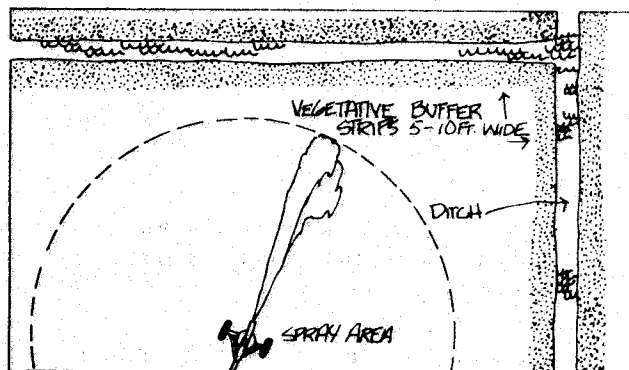
- (e) Do not spread manure on bare soils and leave over the winter without incorporation into the soil.



## Solution B

### Minimize Manure Flow Off the Fields

- (a) Use vegetative filters (especially grass) as buffer strips to reduce surface runoff. This is a low cost method and is extremely effective. Grass buffer strips of 5 to 10 feet in width should be established adjacent to all streams, ditches and ponds.



- (b) Incorporate manure with the soil as soon as practical whenever making pre-plant application. This can be easily done by plowing down, disking in, or by soil injection of the manure.

#### Advantage

The manure with its associated nutrients stays on the land. Also, by following these guidelines, unintentional introduction of manure into streams or ditches is minimized.

#### Disadvantage

Manure storage facilities may need to be installed on some farms.

#### Cost

No direct monetary cost unless storage facilities are needed, (see CONFINEMENT AREAS, Problem 6, Solution B). However, an increased awareness by the farmer is needed concerning the location, timing and suitability of a field for receiving manure.

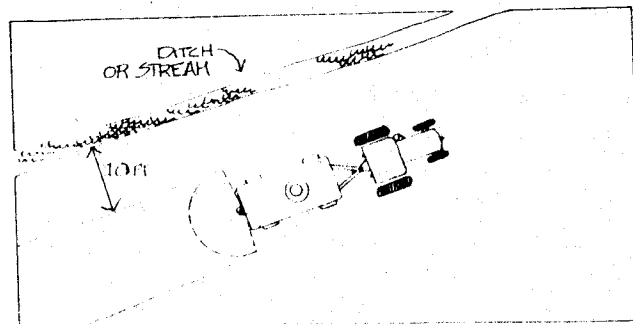
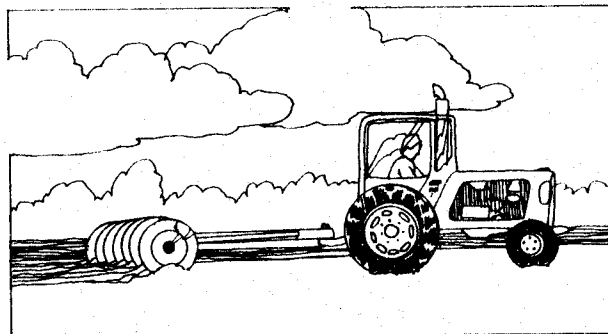
### Problem 3

Animal manure is sometimes spread directly into ditches or streams, causing severe water quality problems.

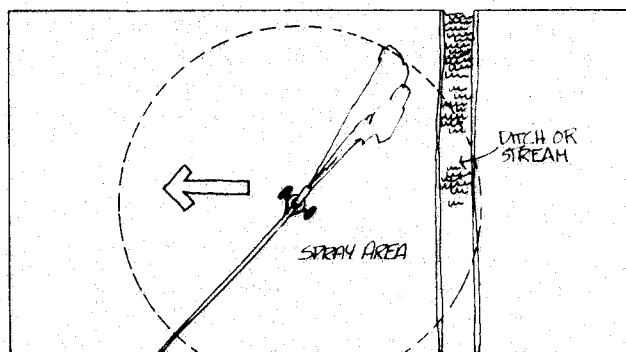
### Solution A

Follow Certain Guidelines

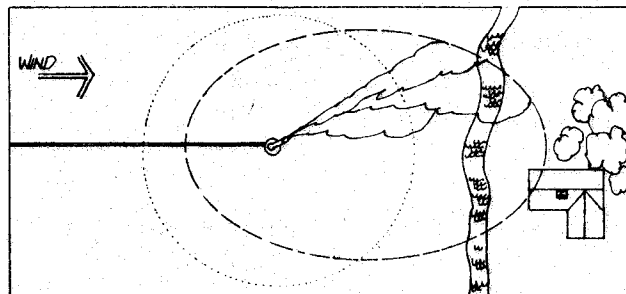
- (a) Protect waterways by leaving a 10 foot wide buffer strip of grass from the outer edge of the discharge pattern to the water.



- (b) Set pipelines and manure guns at the proper distance to prevent spraying directly into waterways. The distance required will vary with conditions. The percentage of suspended solids, length of run from pump, and slope will influence discharge pressure at the gun nozzle.

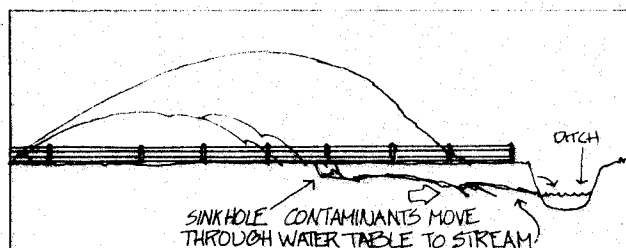


- (c) Adjust manure gun position in the field to account for velocity and direction of prevailing winds at time of spraying so that the liquid will not be deposited in the waterways.



- (d) If ponding and runoff occur while spraying the liquid manure, move to a new area. (See APPLICATION OF MANURE, Problem 2, Solution B.)

- (e) Do not spread manure over "sink holes" or other subterranean waterway entrances where manure may subsequently be carried to streams.



- (f) Convert open ditches to closed systems where practical. The soil mantle overlying tile drains can be very effective in removing polluting material. Conversion to closed ditches will also make field operations easier for the farm operator.

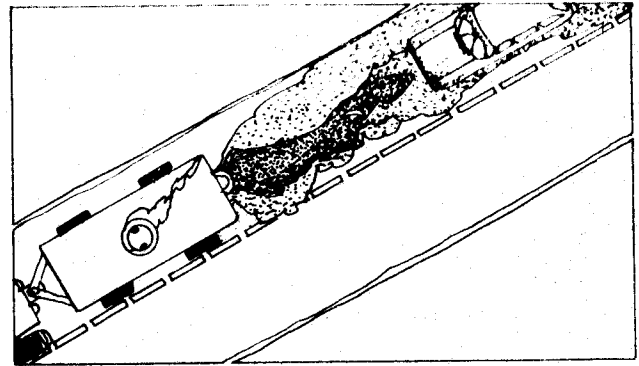
- (g) Install permanent "manure tight" crossings over streams and ditches for piping to manure guns.

There are some other considerations which must be remembered when applying manure.

Distribute manure as uniformly as possible on the area.

Heavy applications of manure should be limited to soils where mobile nutrient movement will not intercept groundwater flow to streams or ditches. Use light manure applications on shallow soils over impervious layers where lateral drainage to waterways occurs. Examine ditch and streambanks periodically for evidence of lateral seepage of pollutants. Look for green colored seepages or slimy growths. If such evidence is found, stop application of manure until the problem disappears. Use a reduced loading rate thereafter.

Prevent spills from occurring when transporting manure along public highways from one farm to another.



#### Advantage

By following these guidelines, the chance for unintentional introduction of manure into streams or ditches is minimized. The manure and associated nutrients stay on the land where they can be utilized.

#### Disadvantage

None

#### Cost

Increased surveillance by the farmer during manure applications.

## Pasture Situations

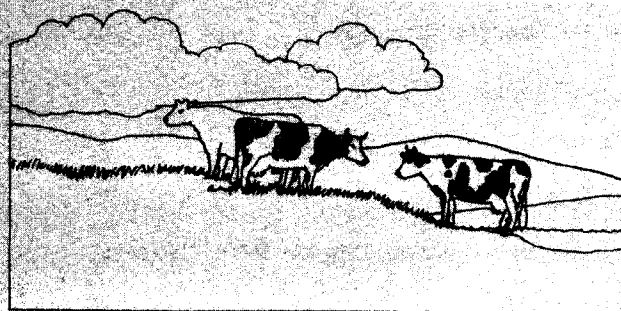
Large numbers of grazing animals having access to an adjacent stream or ditch can result in water pollution, bank destabilization, erosion and accidental injury to the animals.

For each individual farming operation the decision must be made as to whether the grazing animals should be isolated from streams or ditches. Such factors as animal density, total number of animals having stream access, and whether the flow is intermittent or year round are all important factors in this decision.

This section on pasture situations presents several alternative methods to limit animal access once the decision to do so has been made. There will be many places where none of the solutions presented here will be practical and livestock should be allowed general access to streams. Farm operators using streams in such a "free choice" situation should attempt to keep livestock activities in streams to the absolute minimum, recognizing that citizen complaints for water pollution may be filed against them. Problems such as this should be considered on a case by case basis.

### Problem 1

In a particular pasture situation, animal access to water results in objectionable water pollution. Complete restriction of animal access to the stream or ditch must be undertaken.



## Solution A

### Install Fence at Top of Bank

Run a barbed wire fence just over the top of the ditch or streambank. If the stream lies in a shallow depression, the fence should be set back five to ten feet from the edge of the stream. Water must be piped to the pasture or pumped from the adjacent stream to a watering point. This watering point should be well removed from the stream.

#### Advantage

The water pollution problem will be greatly reduced and the stream or ditch banks will be less susceptible to damage and erosion. In the case of steeply sloped banks, the risk of animal injury or loss is also reduced. Periodic accounting of animals is made easier.

#### Disadvantage

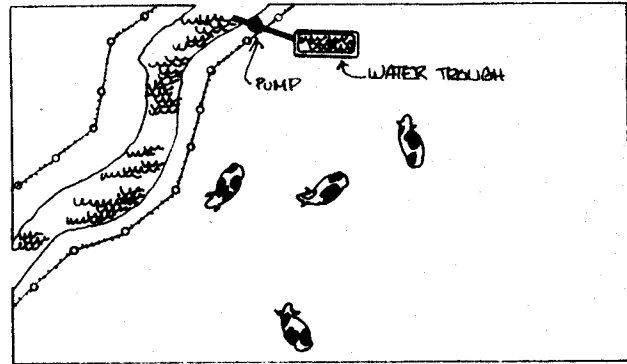
Fencing can be quite costly on large plots remote from a confinement area. Parallel fences must be constructed on both sides of the stream, thus reducing the grazing area in the pasture. Water must be pumped or piped to a watering site. At present, a water withdrawal permit is needed if water is to be pumped from the adjacent stream.

#### Costs

Fencing: \$.40 – \$.50/lineal foot

Water Supply: Pipe, pump, electrical service – \$1,000 – \$1,500.

State Water Right Application for Stock Watering – \$60.00.



## Solution B

### Use Gravity to Deliver Water to Animals

In certain situations, when animals are denied access to a stream or ditch (see Solution A), a gravity pipe can be set up to deliver water for drinking. The stream must drop from a sufficient height as it passes through the field to develop enough head to deliver piped water to a watering trough located at the downslope side of a field.

A simple procedure to test for this is to lay a hose with one end located in the stream at the desired point of withdrawal. Place the other end of the hose at the desired location and height of the future water trough. If water flows out of the hose, you're in business. If not, experiment by moving the intake further upstream, or changing the desired location of the watering trough. During installation, the hose or pipe should be buried where it crosses the pasture.

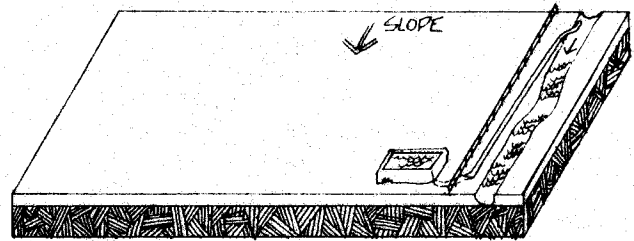
Flow into the trough can be controlled by a shut-off valve connected to a float and preset to maintain a given water level. The water outlet to the trough and the adjacent float should be screened to protect against damage from drinking animals. Under no conditions should the water be left continuously flowing into the trough.

#### Advantage

A gravity pipe is a cheap, reliable method to deliver water to animals.

#### Disadvantage

This method will work only in pastures with enough slope to develop the necessary hydraulic head. At present, a water withdrawal permit is needed in order to divert water from a stream.



### Cost

Pipe: \$.30 per lineal foot for 2 inch diameter PVC pipe

Water Trough and Valves: 100 gallon tank is \$60.00, 300 gallon tank is \$100.00

## Problem 2

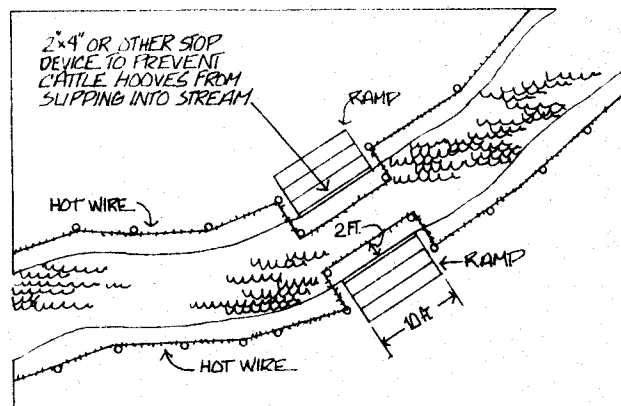
In some pasture situations, limited animal access to water, rather than total exclusion, is undertaken.

## Solution A

### Construct an Entrance Ramp to the Stream

When streams or ditches are parallel and adjacent to roadways or other barriers, it may be practical to fence the side of the waterway nearest the field, thereby keeping livestock from general stream access.

Watering points can be provided by setting the fence back 2 feet into the waterway for a distance of 10 feet along the stream. This will allow two head at a time to drink without actual entry into the stream. An entrance ramp should be provided at each access point to prevent bank destruction by cattle hooves. The ramp can be made of concrete, old railroad ties, surplus military landing mats or similar material. If made of concrete, the ramp should be raised in the middle running longitudinally (i.e., a cross section of the ramp is convex), with small grooves running from side to side. This will retard runoff and manure from flowing directly into the stream during rainfall. This system could also be applied in situations where the stream or ditch flows through the middle of a pasture. An access ramp can be installed on each side of the stream.



#### Advantage

Improvements in water quality will occur without the need to provide another means of water for the animals. Stream and ditch banks will suffer less damage and erosion potential is reduced. No permit for water withdrawal would be needed.

#### Disadvantage

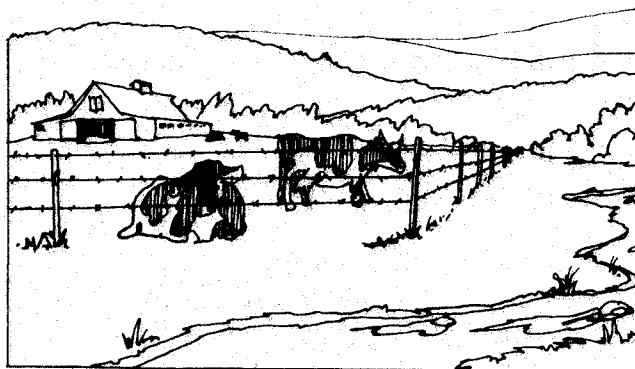
There is a greater potential for water pollution than under a no access situation, but obviously less than for animals with free access. A fence must still be constructed to reduce animal access.

The solution is only possible on streams which do not undergo a great variation in width (greater than five feet) during the year. Therefore, it is only suitable for small to moderate sized streams. The proper choice for a ramp location (deeper, narrower sections along the stream) can partially overcome this obstacle.

#### Cost

Fencing: \$.40 to \$.50 per lineal foot.

Ramp: \$50.00 to \$80.00 if railroad ties are used.



## Commercial Fertilizers

The use of commercial fertilizers is an essential part of most American crop management practices. However, commercial fertilizer must be applied properly or several problems can result. First, a portion of the fertilizer

can be washed off the field, thereby becoming unavailable for crop production. This loss of fertilizer results in excessive costs to the farmer, which will continue to increase with the price of commercial, synthetic fertilizer. The second problem is the collection of fertilizer in collection ditches and, eventually, rivers. The oversupply of nitrogen and phosphorus can over-fertilize a river or estuary to the point where undesirable growths of water plants and/or algae interfere with the natural flow in the ditches and threaten the habitat of native fish and other benthic organisms. For these reasons, it is desirable to take steps which will minimize loss of these fertilizers to the streams and ditches.

### **Problem 1**

Improper fertilizer application results in loss to the crops and pollution of waterways.

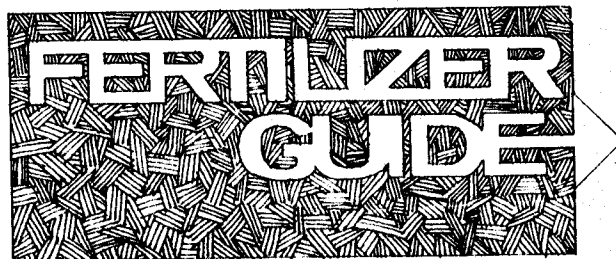
### **Solution A**

Follow WSU Fertilizer Guidelines to Determine Per-Acre Quantities

To determine the proper amounts of fertilizer to produce satisfactory yields with a minimum of fertilizer waste, use the fertilizer guide series (FG's) published by Washington State University. These FG's are the result of many years of research and field experience and are designed to combine research data with soil test information. The quantity of fertilizer used should be based on the appropriate FG for a particular type of crop. The FG's can be obtained through your local Cooperative Extension Office (County Agent).

### **Solution B**

Follow Proper and Prompt Soil Incorporation Techniques



Following recommended fertilizer application procedures as stated in the FG's, such as plowdown, surface incorporation, or band placement, depending on the crop and other variables, will reduce the possibility of surface runoff to waterways.

For those crops such as established forage stands, which do not lend themselves to any of the incorporation methods, the FG's suggest time-spaced fertilizer applications. These are based on such things as stand condition, soil test data and availability of irrigation.

### **Solution C**

#### **Do Not Apply Fertilizer When Substantial Rains are Expected**

Whenever possible, incorporate fertilizer into the soil. However, when fertilizers are top dressed, avoid spreading on sparse stands on slopes when heavy storms are anticipated. Rather, confine spreading to periods when moderate precipitation is expected, so that excessive surface loss of applied nutrients will not occur.

#### **Advantage**

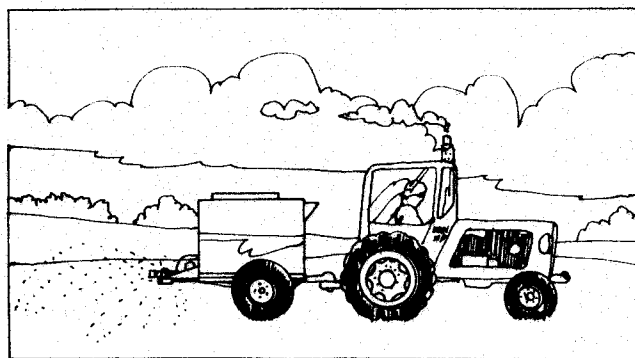
Resource nutrients are saved for use by the soil and the waterways are not polluted.

#### **Disadvantage**

None.

#### **Cost**

None.



## Solution D

### Avoid Putting Fertilizer Directly Into Waterways

Avoid filling fertilizer spreaders near streams or ditches where accidental spillage may enter waterways.

Do not spread fertilizer over streams or ditches. Operating certain spin type spreaders too close to a waterway will result in fertilizer being cast directly into the water. Spreaders which drop fertilizer directly below the hopper can be operated close to the bank, provided that proper attention is given regarding rates, slope, vegetation, etc., as previously noted.

#### Advantage

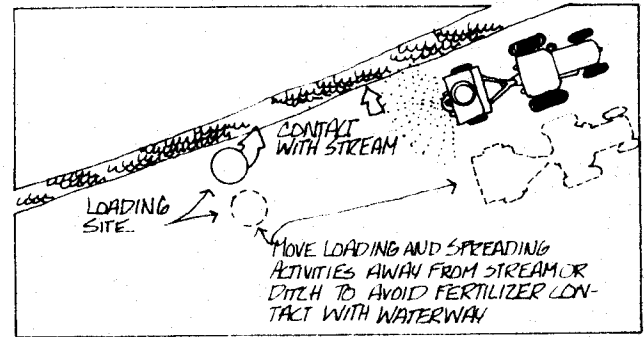
Just as for Solution C, this solution assures efficient use of applied fertilizer, keeping it on the field and reducing seepage or washoff, which improves local water quality.

#### Disadvantage

None.

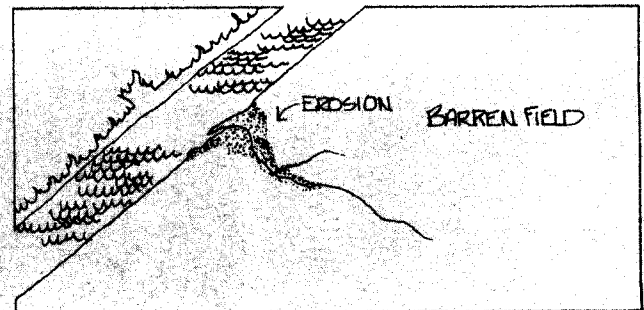
#### Cost

None.



## Problem 2

Erosion and sediment loss are major stream pollutants and result in reduced pasture areas, loss of topsoil, and reduced agricultural production.



## Solution A

### Precautions Should be Taken to Prevent Sediment Loss to Streams

Eroded soil from fields can be a major source of phosphorus and nitrogen in water. To mitigate the erosion potential, vegetative cover should be used whenever possible during the winter months, especially on fields with a sufficient slope to allow surface soil movement from storm runoff. Fields subject to such soil loss should be tilled in the spring rather than the fall.

Exposed soil should also be avoided in non-crop areas. Spread the spoils from ditch cleaning, pit silo excavation and other farm construction activities so the soil can naturally revegetate itself. Cut banks and other exposed areas should also be revegetated.

#### Advantage

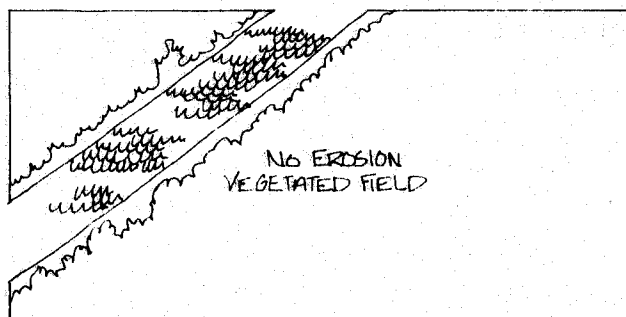
Erosion and soil loss will be greatly reduced, as will the need for local regrading in a field. It will also keep nutrients in the soil for crop production and will reduce sediment load in local streams.

#### Disadvantage

Many fields must be planted with a winter cover crop to avoid erosion.

#### Cost

Cost for seed would be the only expense.

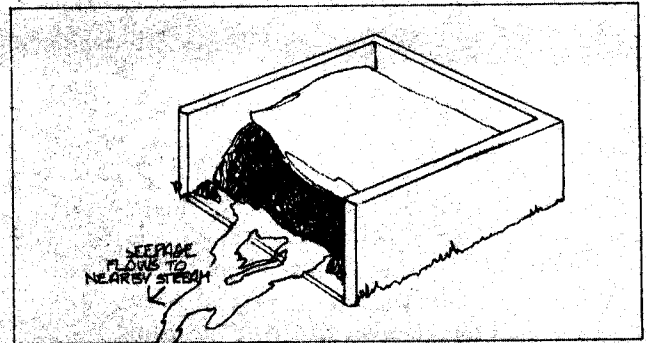


## Silos

Most of the larger silos are unroofed and exposed to the weather. Although the silage is often covered with plastic sheets, considerable seepage from the pack still occurs. It is common to find saturated soil conditions, resulting in seepage of silage liquor from the immediate vicinity of the silo. Although this is not considered a major water pollutant, it can result in noticeable local water quality problems.

### Problem 1

Seepage from silage pits often flows to nearby streams and ditches, resulting in pollution problems. This pollution creates a reduction in oxygen to support animal life in the water. Unpleasant odors are another byproduct of silage seepage.



### Solution A

#### Minimize Silage Seepage

To minimize seepage, avoid ensiling excessively wet material, as it will create large drainage losses and also will make inferior silage due to the loss of nutrients from excessive leaching.

Cut silage at optimum moisture content. At the time the silage is placed into storage the moisture content should be 65% to 75%. To reach the correct percentage of moisture content, wilt high moisture forage before ensiling.

The moisture content of silage can be estimated as follows: Compress finely chopped

forage (1/2 inch) between the hands for about 30 seconds. Release the pressure suddenly and check the condition of the ball and the amount of moisture by using the following table as a guide.

Condition of Ball	Approximate Moisture Content
Ball holds shape and there is considerable free moisture on the hands	over 75%
Ball opens slowly and there is little free moisture	60 – 70%
Ball falls apart rapidly	below 60%

In order to minimize seepage losses, field corn should be ensiled when kernels are well dented and leaves are still green. Use an additive to absorb plant juices and reduce silo drainage. Some good preservatives which can be used are: dried beet pulp – 100 to 200 lb/ton; ground wheat, oats or barley – 150 lb/ton; or dry hay – 250 lb/ton.

#### Advantage

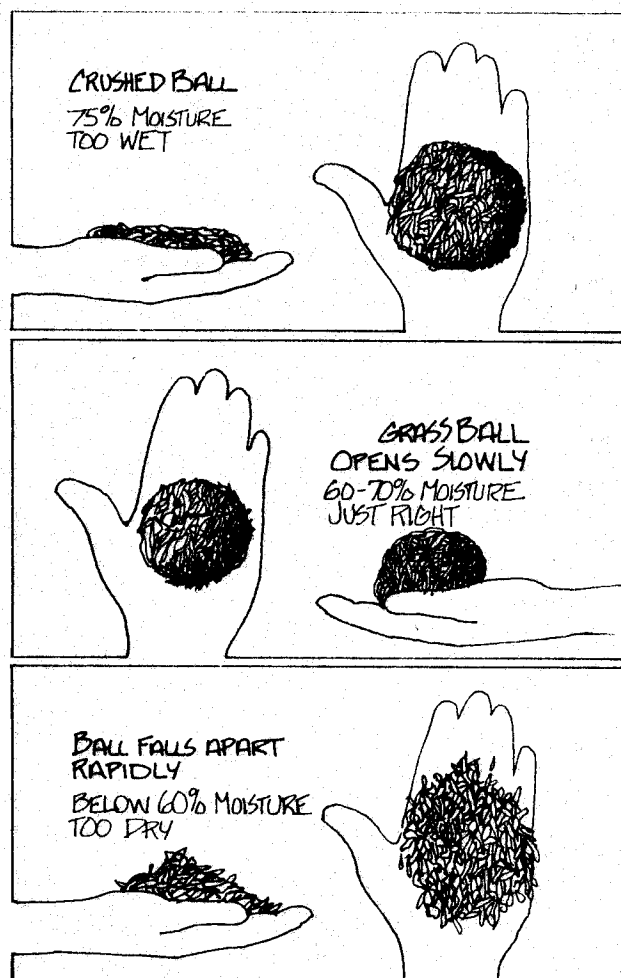
These measures will reduce seepage and help retain the nutrient value of the silage.

#### Disadvantage

Weather is a determining factor in deciding when to cut silage.

#### Cost

The cost of recommended preservatives varies but will be recovered due to the higher food content of the silage.



## Solution B

### Contain or Divert Seepage

A low earth dike can be built around the mouth of the silage pit to contain seepage and let it sink into the ground. Or, a gutter and drain can be installed to divert the seepage to a manure tank or storage lagoon.

#### Advantage

The seepage is controlled.

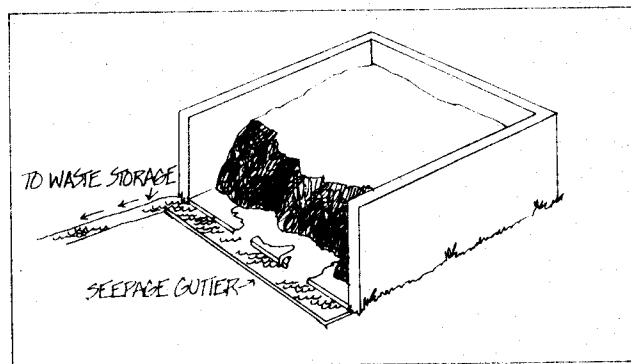
#### Disadvantage

If soil drainage is very poor this containment method may not work. Diversion to a manure collection system will only work if the silo is above the manure storage device. However, the seepage could simply be channelled to a suitable location for land application.

#### Cost

Low earth dike — minimal cost.

Diversion from surface waters — minimal cost.



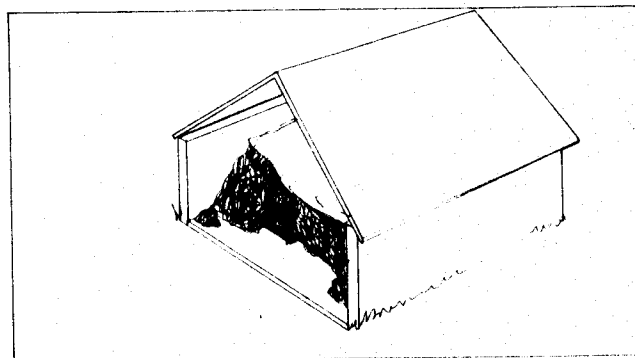
## Solution C

### Roof the Silo

Roofing the silo and diverting water, as previously noted, will provide water quality control and better silage. Eighty percent of the total nutrient loss from silage is due to seepage loss from uncovered bunker silos. Seepage is caused by excess moisture from rain and snow filtering through the silage, plus loss of silage juices from excessive moisture in the forage at the time of ensiling.

#### Cost

\$1.50 to \$1.75/ft<sup>2</sup>

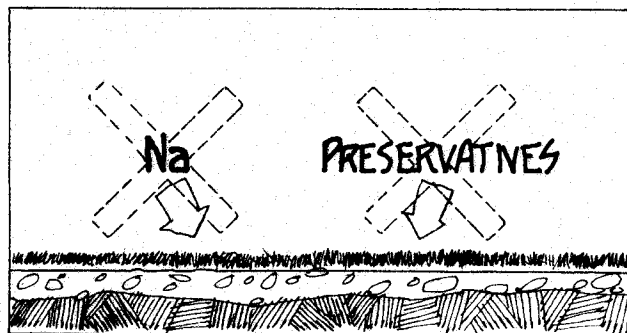


## Vegetable, Fruit and Dairy Products Processing Plants

This section is different from the previous sections in this chapter in that it deals with potential pollution problems from a packing plant which processes farm products rather than from an individual farm. This section deals with minimizing the potential for non-point source pollution from this industry, that is pollution resulting from land disposal of wastewater. Land application of wastewater is a common practice of this industry because adjacent open land is often plentiful and because land application is generally the cheapest responsible method of disposing of process water. This section will not present a detailed discussion of design for a land application system. However, certain basic design and operational criteria must be met first if such a system is to be operated successfully and undue water pollutants avoided.

### Basic Factors in Design

- Residual chemical substances such as high concentrations of sodium or preservatives in the water must be reduced below those levels detrimental to the soil, plants, and living organisms, and must not adversely affect the soil's ability to transmit water.

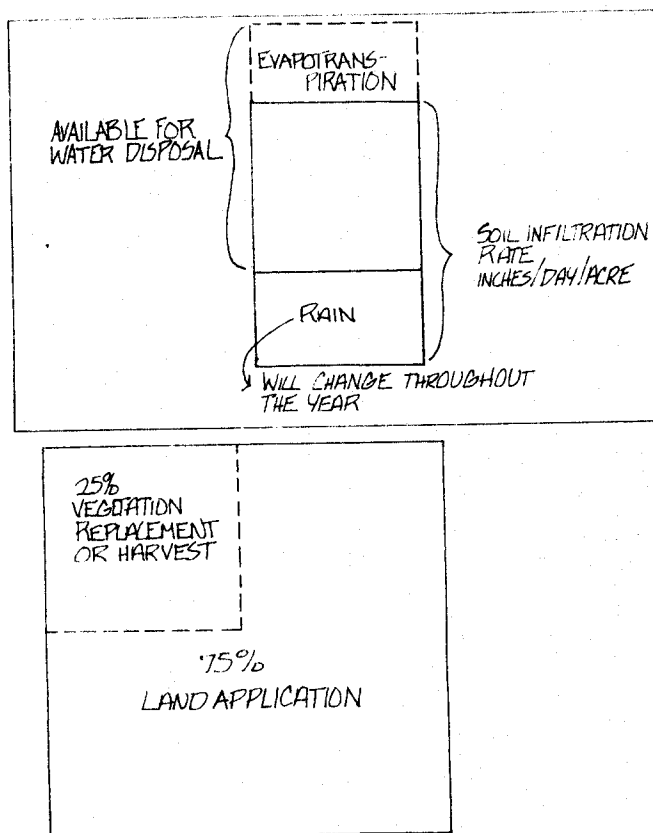


- Volume of wastewater to a given land area must not exceed the renovation and disposal capability of the land area available. Such factors as soil infiltration rate, rainfall and evaporation will determine the maximum daily volume of water that can be applied to an acre of land. Enough land should be provided to handle the entire process flow.
- An additional 33% of the minimum required land should be acquired. Removal of approximately 25% of the entire filter system for part of each year is necessary for reestablishing the stand of vegetation. Systems which do not provide for periodic replacement of the filter are underdesigned, and usually cause trouble due to aging of the grass filter. However, if the process plant only operates for part of the year, vegetation replacement can occur during the off-season, eliminating the need for extra land.
- Lagoons or other effluent storage facilities may be required when:
 

Flow of wastewater varies considerably, or when there is too little to justify continuous pumping.

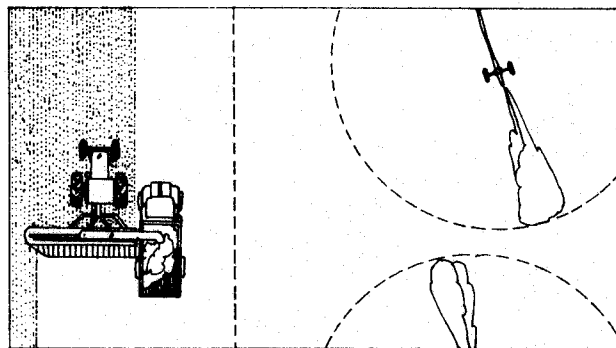
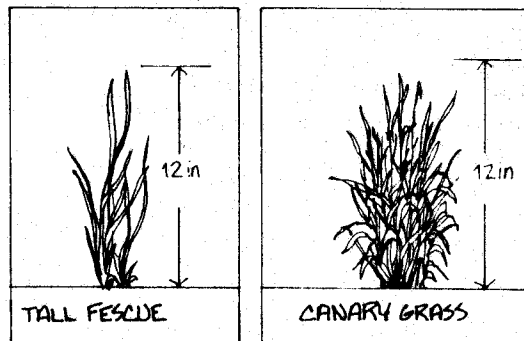
Irrigation must be discontinued because of heavy rainfall or extremely cold weather.

Overland flow through the living filter can be used when soils have limited infiltration characteristics, a slope of 2% to 6%, and a system of ditches to intercept and remove renovated water.



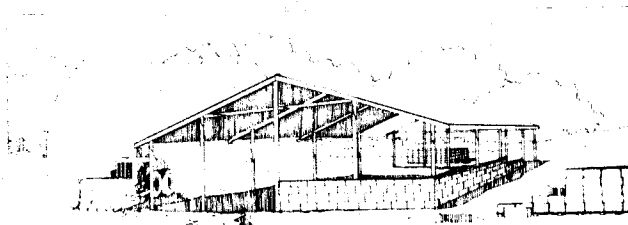
## Basic Operational Factors

- Vegetation selected for the living filter should have a harvest value to encourage its removal and hence remove some of the applied nutrients from the site. For example, grasses make the best filter and can also be greenchopped for immediate feeding or ensiling. Grasses should be selected for adaptability to moist soil conditions and capability to provide support for harvesting equipment. Tall fescue and canary grass, properly managed, can be satisfactory choices.
- Facility design should allow sufficient land to provide cessation of effluent application on soil. This provides time for evaporation, drainage and operation of harvesting machinery without damaging soils and filter system by causing deep ruts and/or soil compaction.



# Chapter 2

## Finance and Tax Considerations



Implementing agricultural "best management practices" obviously may mean incurring some costs and spending some money. Many BMP's will, however, benefit the farmer through recovery or conservation of resources and productivity gains, while all of the BMP's will benefit the public by preserving the beauty and excellent quality of the area's water. Pollution control has become everyone's responsibility.

### Individual Financing

Traditional lending institutions, including commercial banks and member organizations such as the Federal Land Bank Association (FLBA), are the best sources of funds for most BMP activities. The Association is a cooperative lending institution which makes loan funds available to member farmers for

capital and operating purposes. For capital improvement projects the current interest rate is 8.5 percent with a 30 – 35 year term and a 1 percent loan fee charge. Loans for construction activities are for a minimum of \$10,000. Larger loans require approval from the board of directors.

If a farmer is unable to obtain sufficient credit from a lending institution, application may be made to the Farmers Home Administration (FmHA). A part of the U. S. Department of Agriculture, FmHA offers loans and loan guarantees to individual farmers, rural residents and communities for a variety of capital and operating purposes. Pollution abatement practices and devices which have been identified as BMP's are eligible for farm operating loans. One significant criterion for eligibility is that a farmer must be unable to obtain sufficient credit elsewhere, as the FmHA program is designed to supplement other sources of funds. Also required for loan application is a conservation farm plan. The FmHA's operating loans generally have a term of 1 – 7 years with the possibility of a renewal for 5 years. Other programs for large projects or other purposes

have longer terms or are simply loan guarantees.

Under recent legislation (PL 94 305), the Small Business Administration may now provide loans for pollution control facilities to individual farmers, as well as corporate or partnership farming concerns. The purpose of this program is to make funds available for expenditures or losses incurred in complying with a state or federal regulation. The loans are taken from the Disaster Loan Fund, and the amount is determined by the extent of the "injury". To have a loan approved, it must include certification from the Environmental Protection Agency that the pollution control equipment is "necessary and adequate" to meet pollution control requirements. The loans currently have a 30 year term and an interest rate of 6.72 percent. The SBA also provides loan guarantees to some farming concerns, primarily corporate, which meet its regular program criteria.

### Direct Funding

BMP's may also be funded directly by state and federal agencies, most notably the Agricultural Stabilization and Conservation Service (ASCS). A part of the U. S. Department of Agriculture, the ASCS will provide grants for selected activities on individual farms; they are not a lending institution and cannot provide loan guarantees. Grants of up to \$2,500 per farm may be obtained for cost-sharing of various capital improvements. Pollution control facilities (including manure tanks), drainage control facilities and stream-bank stabilization programs are grant-eligible activities. Annual funding for the ASCS varies, as does their priority schedule for eligible projects. Projects which have a public benefit, such as improvement of general water quality, have the highest priority.

Currently, there are few other direct funding sources available to the individual farmer. However, there is great potential for such funding for public organizations or agencies with farmer members, such as conservation districts. For example, the EPA not only certifies pollution control loans made by the Small Business Administration, but also provides grant monies for demonstration projects. However, this is not a likely source of funds for the development or implementation of agricultural BMP's.

Another source of possible loans or grants to public or private entities for a variety of projects, is the Economic Development Administration (EDA), a part of the U. S. Department of Commerce. Their criterion for providing funds is a defined need for the project in relationship to economic development. Consequently, this is not a likely source of funds for the development or implementation of BMP's.

A potential source of funds for assisting with the implementation of agricultural BMP's is the Washington State Department of Ecology (DOE). Financial assistance for the abatement of water pollution stemming from agricultural practices was authorized under Referendum 26 (RCW 43.83A). DOE has not yet established the criteria for the program and its allocated funds (\$3,000,000 for the 1978-1979 biennium), but the program basically consists of grants to a public entity, such as a conservation or irrigation district, with a 50 percent local match requirement which may be met with cash or in-kind service. Possible activities under this program include demonstration projects, district owned service equipment, community drainage projects, etc.

In summary, there are a number of funding sources which can be contacted to assist farmers in developing BMP's. The Federal Land Bank is a promising source for loans, as are the Farmers Home Administration and the Small Business Administration. Direct funding may be received from the Agricultural Stabilization and Conservation Service (U.S. Department of Agriculture), or the Washington State Department of Ecology.

## Tax Considerations

Section 169 of the Internal Revenue Code permits 5-year straight-line depreciation of certified pollution abatement facilities which abate air or water pollution discharged by plants or properties. To utilize this depreciation method, taxpayers should be made aware of applicable State and Federal regulations qualifying air and water pollution control facilities within program guidelines (EPA, Information on Rapid Tax Amortization, 1971). Also, taxpayers should be instructed to refer to 1977 Editions of I.R.S. Publications 225 – Farmer's Tax Guide, and 535 – Tax Information on Business Expenses.

All three publications will be updated by the end of 1977. The update will outline new laws concerning timeframes for facility installation and operation. Taxpayers should be advised to contact their respective local, State and Federal agency offices for revised literature and current information on filing procedures. Because certification procedures necessary to use accelerated depreciation schedule vary in each state, we are enclosing a list of appropriate agency contacts within this region.

Appropriate State and Federal agency contacts for certification procedures regarding accelerated amortization of pollution control facilities are:

### EPA, Region 10

Dan Bodien  
Water Permits Section, M/S 521  
U.S. Environmental Protection Agency  
1200 Sixth Avenue  
Seattle, Washington 98101

### Oregon

William Young, Director  
Department of Environmental Quality  
1234 S.W. Morrison  
Portland, Oregon 97205

### Washington

Dick Burkhalter, Supervisor  
Industrial Section  
Department of Ecology  
Olympia, Washington 98502

### Idaho

Larry Koenig, Manager  
Source Control Section  
Bureau of Water Quality,  
Division of Environment  
Department of Health & Welfare  
Statehouse  
Boise, Idaho 83720

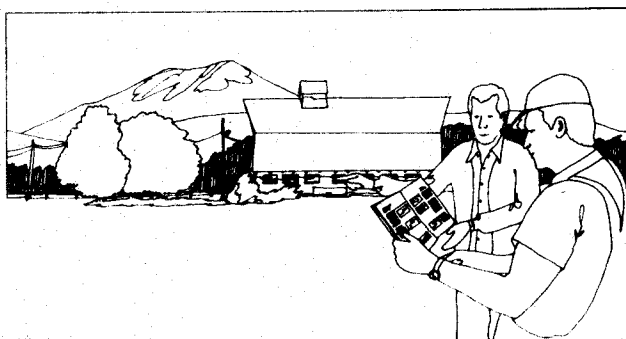
### Alaska

Woody Angst, Permits Coordinator  
Department of Environmental Conservation  
Pouch O  
Juneau, Alaska 99811



# Chapter 3

## Management



The agricultural "best management practices" must have an ongoing system or structure for planning, implementation, and management in order for them to be effective and ensure fairness to the farmers in the future.

To the extent possible, the management structure suggested is voluntary; it relies heavily on the good faith efforts of farmers to use the BMP's without the extensive use of regulation or enforcement actions. This voluntary approach to implementing the BMP's is very valid for several reasons. One, some farmers are already using BMP's, so there is no need to further regulate them. Two, it minimizes the bureaucratic "red tape" with

which both farmer and government agency staff must deal. Three, conditions are different at each farm, making different BMP's appropriate in each case. By keeping implementation voluntary, more flexibility in the application of the BMP's is possible. And finally, the problems of concern in the SNOMET/King County 208 area are limited enough that a highly institutionalized regulatory/enforcement structure is unnecessary.

Notwithstanding the previous comments, since voluntary implementation will probably not guarantee full BMP use nor necessarily satisfy improvement of water quality, a "back up" must be provided. Federal laws and regulations have taken this into consideration and require that a regulatory and enforcement mechanism be identified for implementation of BMP use. Recognizing these facts, the management structure presented in this chapter includes enforcement measures where necessary. Where regulation or enforcement is necessary, the factors of fairness and flexibility are paramount. The following sections describe the BMP implementation programs, who will be responsible for them,

and how the entire structure will function.

Four basic programs have been developed for BMP implementation (see Figure 1). These, along with the respective involved government agencies, are:

**Education and Technical Assistance Program —**

The objectives are: to provide farmers with appropriate information on specific water quality problems and their technical solutions (BMP's); to convince farmers of the effectiveness of adopting BMP's; and subsequently, to provide assistance in design and construction of BMP's, taking into account individual farm sites and operating conditions. Lead agencies are the King County and Snohomish Conservation Districts, with help from the Soil Conservation Service (SCS), King and Snohomish County Extension Agents, and the SNOMET/King County 208 Areawide Management Agency.

**Financing and Funding Program —** The program objectives are: to minimize financial impacts on farmers and economic impacts on the farm sector as a result of BMP implementation, particularly if capital intensive facilities such as lagoons are required. The Farmers Home Administration (FmHA) and Agricultural Stabilization and Conservation Service (ASCS) will be the primary agencies involved, as discussed in the previous chapter. Other agencies may be the State Department of Ecology (DOE), the U. S. Environmental Protection Agency (EPA), and the U. S. Small Business Administration (SBA).

**Incentive Program —** The program objective is to encourage use of BMP's through incorporation into farm conservation plans. The King County and Snohomish Conservation Districts, with assistance from SCS, have

the lead role and primary responsibility.

**Monitoring and Enforcement Program —**

The program objectives are: to provide data to regulatory agencies for proof of water quality improvement, to identify any lingering problem areas, and to bring enforcement action in areas where farmers have not implemented BMP's and stream segments still suffer significant pollution problems, including, if necessary, the issuance of National Pollutant Discharge Elimination System (NPDES) or State of Washington discharge permits. The Department of Ecology (DOE), the Snohomish Health District, and the Seattle/King County Health Department will perform the monitoring. DOE will bring enforcement actions, based on assessment of the resources damaged, although the Health District/Department may also bring action when a health hazard exists.

The agencies which will be responsible for these programs and their duties are outlined below and in Figure 1:

**Conservation Districts —** The conservation districts will be the front-line administrators for the total program and structure. The efforts of the districts will basically determine the success of implementing BMP's. According to the structure identified, the districts will distribute information to farmers on water quality/waste management problems and their solutions, as presented in this Farm Water Quality Management Manual. The districts will encourage farmers to adopt and use the appropriate BMP's. At all times, the districts will encourage individual farmers to "clean-up" their operations. To facilitate BMP implementation, the conservation districts will provide technical assistance in designing BMP's to the

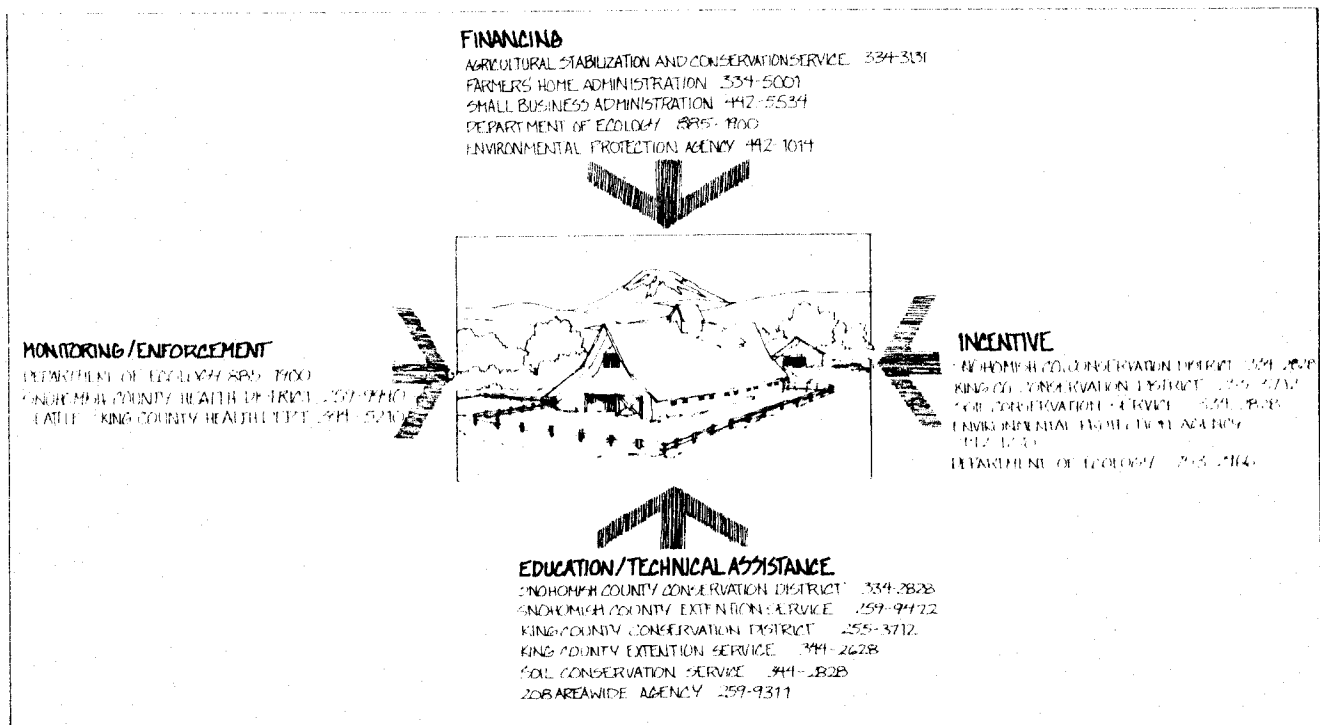
individual farm's site and operation conditions. Subsequently and where necessary, the districts may provide equipment to construct lagoons or other structural BMP's and will charge for its use and operators as allowed by State law. The districts will also direct farmers to financing/funding sources.

The conservation districts will work closely with the SCS and farmers in approving BMP's and incorporating up-to-date information on BMP's into its programs. The use of demonstration projects in the area or research from the WSU Extension Service can be useful in

this regard. Districts may also be involved in cost-sharing programs utilizing public and private funds.

**Soil Conservation Service** — The SCS, as it does at present, will provide back-up for the Conservation Districts. Particularly, the SCS will work with individual farmers who request assistance in applying BMP's to their own situation. The SCS will also assist in updating farm conservation plans to reflect the BMP implementation.

**Figure 1**  
**BMP Implementation Programs**



**County Extension Service (King and Snohomish Counties) and SNOMET/King County 208 Areawide Management Agency** — These agencies will play support roles to the Conservation Districts in the education program and assist in facility design. They will also act in referring farmers to funding agencies and other technical assistance.

**ASCS, FmHA, SBA, DOE, and EPA —**

These five agencies will be primary sources of public funds to assist farmers in implementing BMP's. The previous chapter on financing describes the types of financing available from each of these.

**Seattle/King County Health Department and Snohomish Health District** — The health agencies will cooperate with DOE in establishing a monitoring system in the Snohomish Basin. Data gathered will be used to monitor the impact of BMP implementation on water quality and to identify stream basins or river reaches for which problems continue to persist. This data will not be used for enforcement actions against individuals. Additional intensive, site specific data will be required for enforcement. Where a clear public health threat has been identified the health agencies, using their existing legal authority, may take legal action against violators. The health agencies can refer the violators to the Conservation District for assistance in correcting the situation.

**SNOMET/King County 208 Areawide Management Agency** — During the course of the 208 Study (until January 1978), the SNOMET/King County 208 study team can assist the conservation districts in their educational and technical assistance programs. The designated 208 areawide management agency

(not yet determined) would assume these duties after January 1978. This agency would coordinate, on a continuing basis, the activities of those involved in the agricultural runoff control structure, including those maintaining a water quality data file for the monitoring program.

**Department of Ecology** — In conjunction with the health agencies, DOE will operate a basin-wide stream monitoring system. Again, enforcement actions will require additional site-specific monitoring. When specific violations of water quality standards are detected, and the violator determined, DOE can bring enforcement action under existing state law. DOE will notify the Conservation District(s) prior to commencing enforcement actions. The State or NPDES program may be used to control farm operation discharges instream by issuing permits with compliance schedules. (It should be noted that NPDES permits have already been issued to the several large farm operations in the 208 area which fall within the general provisions of the permit guidelines.) However, farmers fully utilizing approved BMP's will not be subject to enforcement actions, even though water quality standards are still not met. DOE will continue to administer and enforce existing NPDES discharge permits for large operators in the basin who clearly fall within the permit guidelines (see Appendix A). Again, DOE will refer violators to the conservation districts for technical assistance. In such cases, agreement on appropriate clean-up actions should be reached between the farmers and DOE after consultation with the district and SCS.

How then will this new structure work? During the summer of 1977, farmers will begin receiving information on BMP's, includ-

ing this Farm Water Quality Management Manual, and information from the Conservation Districts, SCS, and Extension Offices. After reviewing the information, farmers should contact the Conservation District or SCS to find out whether BMP's may be required for their operations. In many cases, individual farmers may find they are already using the BMP's. If this is the case, the SCS staff will ensure that this is noted in the farm conservation plan. For those who will have to begin using BMP's, the SCS will, if necessary, provide technical assistance in planning and design. In the future, where enforcement action may be pending, the farmer will be approached by the Conservation District which will offer their technical assistance in correcting problems.

As is apparent, the BMP implementation structure relies heavily on existing agencies and programs. The major changes are more formalized relationships among the agencies involved in the active effort to establish the use of BMP's, including providing updated information on BMP's in the future. All of the agencies involved presently have authority to perform the tasks and programs assigned them by this management structure.



# Appendix

## Agricultural Practices and Their Effect On Water Quality in Western Washington

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Results from studies and sampling programs conducted in the study area, determined that pollutants were reaching its waterways from agricultural sources. As a first step in reducing the possibility of such pollutants reaching the water bodies, a program was initiated to determine the specific agricultural practices which were contributing the highest percentage of pollution. Once these were determined, alternative farm practices were developed.

A Farm Plot Runoff Survey to determine the quality of the runoff from several area farms was conducted between May and November of 1976. The results of this survey aided in the development of recommended Best Management Practices (BMP's). The following description of how the survey was conducted and the conclusions drawn from the data collected will give a better insight into the reasons for selecting the recommended BMP's which were presented in Chapter 1.

### Setting Up and Performing the Survey

With the assistance of the Washington State University Extension Staff and Soil Conservation Service Agents of Snohomish County,

six farms were selected on the basis of their use of one or more common farm management practices. These practices include such things as row cropping, pastured fields, fields where animals have direct access to a stream, animal confinement areas and manure disposal areas. Four of the farms selected were located in the floodplains of the area's major rivers (lowland farms) and two were located on the hills above the floodplain (upland farms). (See Table 1.)

The strategy for the survey included measuring the flow and concentration of a number of water pollutants flowing from individual fields under various management practices. So the practices could be tested to determine their relative water quality impacts, a flow measuring device was placed at the lower end of each field farm practice being evaluated. Water samples were then taken and analyzed. In cases where water was flowing in from sources upstream from the field, upstream water samples and flows were also taken to get an accurate measurement of the contribution from the field practices being sampled. Table 2 describes the various parameters for which the samples were analyzed.

**Table 1**  
Farm Plots Selected for  
Intensive Sampling

Farm Plot Number	Management Practice
1	Upland Pasture.
2	Lowland Pasture with Animal Access to Stream.
3	Lowland Pasture Receiving Liquid Manure Application, animal confinement area.
4	Lowland Intensive Crop (Peas) with Dry Manure Spreading, animal confinement area.
5	Lowland Intensive Crop (Sweet Corn and Blueberries) Receiving Chemical Fertilizer Only.
6	Upland Fallow Land with Animal Access to Stream.

To determine whether higher levels of pollutants were being washed off the land during rainy weather, a comparison was made of samples taken during normal flow conditions when it had not rained for several days and samples taken during storm events in June, August and October.

This provided a means of comparing the pollutant load for the different farming practices in the area. To see how the management practices compare, refer to Table 3<sup>1</sup>. For each pollutant the annual loads of all farm plots were divided by the plot having the lowest annual load. For example, if plots 1, 2 and 3 are calculated to have phosphorus washoff loadings of 3, 12 and 18 lbs/acre/year, respectively, their relative

**Table 2**  
Description of the  
Water Pollutants Analyzed

Coliforms	Certain groups of bacteria which indicate the potential for bacterial contamination and resulting health hazard. Fecal coliforms indicate that the pollution source is from the intestines of warm-blooded animals. Total coliforms include fecal plus certain types of naturally occurring soil bacteria.
Biochemical Oxygen Demand	Also referred to as BOD, this is a measure of the amount of dissolved oxygen needed by bacteria to degrade organic material in the water. High BOD levels indicate the possibility of serious dissolved oxygen depletion in the receiving stream.
Total Inorganic Phosphorus	Includes most of the forms of phosphorus being carried off the land into the water system.
Nitrate	The common form of nitrogen fertilizer in an oxygen-rich environment. The chemical symbol is NO <sub>3</sub> .
Ammonia	The common form of nitrogen fertilizer in an environment devoid of oxygen. The chemical symbol is NH <sub>4</sub> .

<sup>1</sup> A detailed development of the data from which this table was derived is presented in the Technical Report for Task 10 of the Snohomish/King County 208 Areawide Waste Management Plan. The report is available at the King County and Snohomish County Planning Departments.

values would be 1, 4 and 6 for phosphorus. Therefore, plot 3 pollutes the water with 6 times more phosphorus per acre in a year than does plot 1.

### Survey Results

Using this method of comparison, those farming practices which contributed the most and least problems could be easily identified. The results showed that animal confinement areas (which

had runoff directly into nearby ditches) had the highest relative loading rates for all of the pollutants, while a forested area had the least. An unmanured, lowland cornfield also had relatively low pollutant loadings. The other farm practices showed moderate pollutant load losses to the runoff with a few notable exceptions.

Four major problem areas concerning pollutant sources were identified as a result of data

**Table 3**  
Relative Yearly Loading Rates  
for Different Farm Practices

	T. Coli.	F. Coli.	NO <sub>3</sub>	NH <sub>4</sub>	T. Phos.	BOD
Forest	1 (1.2)*	1 (.08)*	1 (.71)*	1 (.06)*	1.2	1 (1.67)*
Unmanured Cornfield	16	11	34	19	1 (.09)*	3.6
Upland Pasture	105	488	25	11	7	5
Upland Pasture, animal access to stream	2,293	7,350	8	16	3.2	4.4
Lowland Pasture, animal access to stream	76	80	6	39	1.7	4.6
Land Application of Manure	13	915	30	153	2.4	1.4
Confinement Area 1	8,781	15,425	121	1,386	96	47
Confinement Area 2	47,513	207,937	4,075	12,380	990	1,087

\* actual value in parentheses

analysis. A brief overview is given here of these problems along with possible solutions to them. For more detail regarding the nature of these problems and specific means of dealing with them, please refer to Chapter 1.

## 1. Animal Confinement Areas

The figures in Table 3 clearly indicate that the highest source of water pollution measured on the farm plots was runoff from dairy cow confinement areas. The relative loading of all pollutants was very high, particularly for coliforms. Two major sources of pollutants were: (1) direct flushing of the milk parlor and runoff directly into a ditch from the animal confinement area and (2) overflowing of the liquid manure holding tank and a small hole in the floor of the confinement area which allowed wastewater to escape to surface water.

Both of these dairies are efficient and cleanly run operations with a considerable effort expended to properly dispose of the manure. However, even allowing a small portion of the animal waste to escape into ditches and, ultimately, streams can cause water quality problems. Discharges of manure directly into a stream or ditch should not occur under any circumstances.

## 2. Manure Disposal

To determine the effects of runoff from manured lands, samples were taken from a draitile draining a field on a lowland farm which received heavy applications of liquid manure. The results showed relatively low levels of phosphorus, coliforms and BOD escaping, but higher levels of nitrates and ammonia were leaching out. By keeping an actively growing crop, the loss of nitrate and ammonia can be prevented.

A good rule of thumb to follow in determining whether your own manure collection, handling and disposal system is adequate is to see if any surface water from the manure storage or disposal area reaches a ditch or a stream. Such flows should be eliminated or diverted onto adjacent fields to seep into the ground.

## 3. Animal Access to Streams

Serious water pollution can result when animals have direct access to a stream or ditch for watering purposes, such as in the cases of:

1. A barnyard or feedlot being located adjacent to or surrounding a stream or ditch, or
2. Animals being grazed in a pasture which has a stream flowing through it.

This first situation is similar to allowing surface discharge from a confinement area to reach a stream and should be avoided. In most such cases examined the lot sloped toward the stream, increasing drainage flow into the stream. Stream samples taken above and below such locations showed large increases in bacteria levels. The solutions to this problem are to prevent the animals from having direct access to the stream and grading the yard level or constructing a low berm between it and the stream to trap runoff.

The situation of animals grazing in a field which provides direct access to a stream is less obviously a problem, since the density of animals is less than in a confinement area and the grass cover traps the surface flow of resources and pollutants. Two pastures with unfenced streams flowing through them were tested. In both cases the phosphorus and ammonia concentrations downstream of the

pastures increased slightly. Bacteria, however, increased substantially.

While pastures supporting only a few animals do not pose a great threat to water quality, larger herds can cause a serious elevation in bacteria levels in adjacent streams, thus creating health hazards. In addition, the constant walking of the animals on the streambank increases erosion problems. Large herds grazed on intensively managed pastures should be denied direct stream or ditch access wherever feasible, especially where water tests show an extreme elevation in downstream bacteria levels. Alternative methods of providing water to animals are discussed in Chapter 1.

#### 4. Commercial Crops

Drainage from a lowland blueberry and adjacent sweet corn field was tested to determine the water quality of flow from land that was unmanured but actively fertilized. All of the flow from the plot originated from daintiles or from seepage along the ditch. Comparatively high nitrate levels occurred in the runoff. However, all of the other constituent loadings were relatively low. It appears that except for nitrate loss, plowed fields which receive chemical fertilizer contribute a relatively low level of pollution. There was even a slightly reduced loss of phosphorus per acre than from forested land, the only pollutant for which this was the case.

Most of the intensive farming and commercial cropping in Western Washington occurs in the floodplains where the land is flat. Overland flow and erosion, while potential problems in other locations, are not problems here. However, excessive use of fertilizer, or its careless distribution in the vicinity of ditches is a problem. This increases the likelihood

that phosphorus and nitrogen will be washed or leached into a drainage ditch before uptake by the crop, resulting in overstimulated aquatic plant growth and unsightly water weeds or algae and loss of the fertilizer value of the nitrogen and phosphorus.

With continually increasing fertilizer prices, it is money better spent to use methods which will maintain fertilizers on the lands and available for crop production. This results in more fertile soil, higher land yields, and better water quality.

#### 5. Silage Pits

Although not tested for in this study, a common, related farm water quality problem is runoff or seepage from silage storage areas. Potential problems were visually observed on several of the farm plots. Each had a silage pit adjacent to a ditch with flowing water. Both pits obviously contributed runoff to the ditches. The big problem in such a case is not bacteria, but organic matter and BOD, which can seriously deplete the dissolved oxygen supply of the water. To avoid these problems, direct runoff or seepage to the surface water should be prevented.

#### Summary

Productive agricultural activity and the maintenance of good water quality in the Snohomish and Stillaguamish Basins are compatible and realistic objectives. Meeting these objectives requires effort by everyone to control runoff and pollutant washoff in all farming activities.

APPENDIX C

Management Agency  
Implementation Statement  
(MAIS)

## APPENDIX C

### MANAGEMENT AGENCY IMPLEMENTATION STATEMENT

This Management Agency Implementation Statement is issued as a policy of the Washington State Department of Ecology in accordance with the August 23, 1977 EPA Program Guidance Memorandum entitled Acceptance and Approval of Plans and Designated Management Agencies, Section 208 of Public Law 95-217, and 40 CFR 131.11(o).

WHEREAS, the Washington State Department of Ecology is the designated 208 planning agency for the State of Washington; and

WHEREAS, the Department of Ecology has been designated by the Governor as the management agency for the Dairy Waste Water Quality Management (208) Plan; and

WHEREAS, the Department of Ecology has been performing certain tasks relating to the identification and control of farm animal waste pollution problems in the State of Washington; and

WHEREAS, it has been recommended in the statewide Dairy Waste Water Quality Management (208) Plan that the Department of Ecology continue in this role; and

WHEREAS, the department is enabled to do this work through the State Water Pollution Control Laws, Chapter 90.48 RCW, and the federal Clean Water Act, Public Law 95-217.

NOW, THEREFORE BE IT HEREBY AGREED AS FOLLOWS:

1. The State of Washington Department of Ecology as the responsible management agency for implementation of the statewide Dairy Waste Water Quality Management (208) Plan, will:
  - a. Assure the statewide dairy waste management program is well-managed and produces the scheduled outputs.
  - b. Assure developed BMP are eligible for funding consideration under the Rural Clean Water Program (RCWP).
  - c. Coordinate the dairy waste management planning process with the NPDES program.
  - d. Evaluate the effectiveness of BMP implemented as a result of the statewide dairy waste program.
  - e. Prepare and implement memoranda of agreement relative to dairy waste management among the Department of Ecology, local conservation districts, and the Conservation Commission.
  - f. Promote understanding of the state's dairy waste management program.

2. The department shall coordinate with the Conservation Commission, local conservation districts, and other appropriate state and federal agencies to implement the statewide Dairy Waste Water Quality Management Plan.
3. During the term of any grant agreement for EPA funding of this program, the department shall make a quarterly report to the Environmental Protection Agency including progress made, problems encountered, and recommendations for changes in program implementation.
4. This agreement shall continue concurrently with the department's designation as management agency for dairy waste.
5. The department shall annually review and update the Dairy Waste Water Quality Management Plan in accordance with 40 CFR 131.22.

Elmer C. Vogel 3/16/79  
Elmer C. Vogel                      Date  
Deputy Director  
Department of Ecology